THE

ELECTRICAL REVIEW.

VOL. LXIV. APRIL 23, 1909. No. 1,639.

ELECTRICAL REVIEW.

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THE ELECTRICAL REVIEW.

Published every FRIDAY Price 4d.

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OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGREKAY, LONDON." Code, A B C.

Telephone Nos. Holborn 933 Central 4425 (Editorial only).

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FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

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NOW READY.

THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

THE DAILY PRESS AND INDUSTRIAL BANKING.

To a point of weariness during many years past have we urged the daily Press of this country to take a deeper and more intelligent interest in matters of importance relating to electrical and general engineering.

It hardly needs saying that what is written in technical and trade organs is not read by the man in the street, unless it be copied, as it occasionally is, into some of the newspapers, financial dailies, or magazines, which men feel compelled to peruse more or less assiduously nowadays. The reader of the ELECTRICAL REVIEW is very seldom also interested in, say, the *Draper's Record*, or the *Grocer*, or the *Law Times*, and in the same way a technical journal, however widely it may be read in its own immediate professional or trade circle, is not turned to by those directly concerned with other trades or professions, unless there be something that they have heard of particularly useful to them, perhaps as investors on their own behalf, or perhaps as parents or guardians bearing upon the career of some young hopeful. But such members of the community ought to find in their newspapers a sufficient amount of matter to enable them to gain a fairly accurate idea of questions that are of vital concern to our national industries. We have no desire to dictate to news editors of our great dailies what is their duty on this point; no doubt their space, like our own, is very limited, and the demands of life's multifarious interests—social, political, religious and trade—are at times very difficult to reconcile in the setting apart of columns.

The danger was, and in some papers still is, to secure merely occasional scientific snippets that lend themselves to sensational serving up, however inaccurate they may become by the time the last touches of colour have been added, but it is very gratifying to us to find that one or two of our well-known daily organs are opening their pages to a full and intelligent handling of subjects relating to engineering and to electrical trade.

We are persuaded to write the foregoing by the readiness with which the *Daily Telegraph* has devoted space to a discussion of the electrical question of the hour—if we may so describe it—the importance of financial institutions of this country co-operating with British electrical manufacturers in wresting from the grasp of our Continental rivals, or preventing from getting there, promising concessions which carry with them business which is required to put British electrical industry on a sounder footing. For years past, as our readers will bear us witness, the ELECTRICAL REVIEW has persistently put before this country the case for financial-industrial organisation, and the benefit derived by Continental electrical manufacturers from the efforts they have made at such organisation and financial co-operation.

In considering the needs of the electrical industries, the

topic has been advanced and discussed again and again in the technical journals, and between electrical engineers as they have talked together of existing evils and their remedies. Now at last, late in the day, but not too late to be of wonderful value to our industry if it be pursued to the desired conclusion, the position is placed before the reader of the newspaper, and he weighs the merits of industrial banking proposals as he breakfasts, or as he journeys in from suburbia, and when he gets to town talks the matter over with those among his friends whom he believes to be likely to speak with authority pro or con.

We are glad that this position has been reached, and we believe that only good can result. Floundering about in a sea of suggested remedies for British electrical troubles with as many different diagnoses and remedies as there have been self-constituted physicians, what good could be expected? Here we are on a proposition which seems to at once afford an exemplification of the evil (Victoria Falls), and a hopeful direction in which relief may be looked for. We recently said that the cause of the unsatisfactory position of the electrical industry would be found to be largely financial. None know this better than those who have been engaged in electrical finance in the years that are past. Can we improve the position by the application of a financial remedy? We think we can! We understand that the *Daily Telegraph* correspondence, which we summarise on another page, and which was initiated by Captain H. Benett-Dampier, from whom we publish a letter in our "Correspondence" columns this week, has already produced a sufficiently satisfactory result that a meeting of banking and other gentlemen interested in the subject is shortly to take place, if it has not actually done so before these lines get into print.

The existing deposit banks which must have large amounts available in liquid form may not be able to lend substantial aid. That being so, the necessity exists for financial and electrical authorities together to found a great industrial bank to aid commercial enterprises.

At this stage we are far more inclined to bless the movement than to curse it, and we shall await with considerable interest any news of practical performance that its initiators have to vouchsafe. Many points naturally occur to one in regard to the constitution of such an organisation. How far are British electrical manufacturers in a position, or prepared, to take shares in such a bank? Will it be regarded as combining too much the financial with manufacturing undertakings, so that in balance-sheets the sometimes objected-to item of "Shares, &c., in other companies" will appear, locking up funds indefinitely? The disastrous effect of this sort of thing on some companies is well known. Ought the initiative to come from the banking authorities or from the electrical fraternity? Will it be desirable for it to be a bankers' institution entirely, which would be prepared to inquire into and finance, at more reasonable terms than some trust companies do, electrical concessions that *anybody* may bring forward, obviating the benefit being derived solely by a few firms that may be able to afford to indulge in the speculation of investing in its shares? These may be very elementary questions to raise, and there are, no doubt, many more that naturally occur to our readers, but the matter is yet only in the embryo stage.

The Auckland (N.Z.) Crane Contract.

Since making the remarks that appeared in our last issue on the subject of the difference in British and German prices for the New Zealand electric crane contract, we have received further information from Auckland, which states that the legal advisers of the Harbour Board have replied that the requirements of the Harbours Act do not compel the Board to accept the lowest tender for carrying out a contract. The order has, therefore, definitely come to the British firm. But it seems that other matters besides the question of legality had received attention, for a cable had been sent out from home to the effect that the duty would be £600 less than the sum estimated on the British import, therefore, instead of the British tender being higher than the German, it was actually lower. Various parts of cranes could be admitted under headings other than cranes, thus ensuring a considerable reduction on the estimated amount of duty. A firm of Customs agents said that from £40 to £50 might legally be saved. Some of the remarks made at the final meeting are interesting, the acting-chairman saying that he supported the British tender for other reasons besides that of patriotism, one being that more satisfaction was always obtained from British machinery. The Hon. E. Mitchelson was not present, and there was an attempt to get the matter deferred until he was able to take part in the settlement. This effort was defeated. We gather that the acceptance of the German tender was advised by the Board's engineer (Mr. W. H. Hamer) and Mr. Stanley Bright, consulting and electrical engineer to the London and India Docks. It is satisfactory to note, summing up the whole matter, that the British tenderer was able to win on the matter of price alone; it is also satisfactory that there is a desire among Colonials in New Zealand to aid British manufacturing at home—we wish this desire would reveal itself a little oftener in some other parts of the world.

There is something incongruous in our kith and kin beyond the seas talking about blood being thicker than water and singing "Rule, Britannia!"—pausing between whiles to sign or cable contracts to our foreign rivals, where a little more inquiry might show that when one gets to the bottom of things there is very little difference in the prices, that the better quality to be obtained far more than compensates for the difference, and that there is a greater ability on the part of the home electrical manufacturer than they are aware. That they are not aware what he can do may not be altogether their fault—the blame for that may lie at the Britisher's own door, because he is not so ably in evidence in their part of the world as are the authoritative salesmen and concession-hunters of Germany and America. But of this question more anon! It is not difficult to conceive of a foreigner in charge of our Colonial undertakings having a predilection for the manufactures of his own country—why are so many foreigners in charge, and why are they allowed unlimited power unless it be that those who control the provision of funds are foreign too, or are Britishers who do not care? But it is inconceivable that Englishmen going out from home should have as little regard for the interests of home industry as has the foreigner. Yet we are assured that this apathy is by no means rare. Nor is it absent in high places—but of this also more anon!

Unemployment.

That the volume of trade has a cycle of maxima and minima is well known. The amount of fluctuation in volume is probably less than the fluctuation in value, and the latter is, perhaps, less than the fluctuation of employment. Fall in value for a given weight of trade tends towards economy of labour to counteract smaller profits. When trade is brisk there is a tendency to employ an excess of labour, and this is weeded out when profits fall. The problem of unemployment is one that should be capable of amelioration. Unemployed people are kept alive at great cost.

Evidence comes from Germany which seems to show that by attention to economy, German unemployment in a certain direction has been minimised. In the United States the annual pig-iron production shows a shrinkage of about 33 per cent., the actual tonnage of the shrinkage exceeding the whole production of Great Britain. The British production has also shrunk considerably. But in Germany the

shrinkage has been small, because so much use is made of the blast-furnace waste gas in the direction of power generation that the furnaces have mainly been kept at work, and pig-iron has temporarily become a mere by-product, as some have anticipated that it would, in order that there may be power to drive the steel works to which the gas power has become necessary.

Thus in a time of poor demand Germany is making an excess of pig-iron, and presumably putting it to stock. This is keeping at work the blast-furnace staffs of workmen. When busier times come round, as they must do, Germany will find her large stock of pig-iron very useful. It will steady the markets, will prevent feverish placing of orders for iron, and will prevent a demand for labour that cannot be furnished. If every trade were similarly placed and able to make to stock, the fluctuation of employment would be much less severe. We have no doubt that in the present hard times Germany is reaping a certain reward as a direct result of her promptitude in recognising and acting upon the discovery of the utility and economy of blast-furnace gas. Had we in this country used our wasted gases in electrical work, as might so easily have been done, not only should we have made the direct saving of many millions sterling, but we should have reduced the fluctuation in one section of the labour market. And, incidentally, when busy times came we should have protected the ironworker a little against his tendency to excessive drinking when his wages are too high. The stocked pig would to some extent prevent this, while it would have kept him decently employed during the lean years. The ability to keep a blast furnace constantly at work is very valuable, and it is most desirable for many reasons that pig-iron should be produced in regular quantities, and the heavy cost of blowing out and blowing in furnaces saved. All this might be carried out if only the leaders of industry could be brought to see the value of co-ordinate action. In Germany they have contrived to use their blast-furnace gas power within a short radius of the furnaces themselves, and as we have seen, it evidently pays to make pig-iron as a by-product. There are no reasons why the same should not be the case with Great Britain.

Communication with Moving Trains.

We recently mentioned that successful experiments had been carried out in America for the purpose of demonstrating the practicability of communicating by wireless telegraphy with railway trains in motion. The idea is not, of course, a new one. From the reports it may be gathered that the system worked well; we feel rather sceptical, however, as to the application of radio-telegraphy in its present state for this purpose. On long lines certainly, and in more or less thinly-populated districts, there may be some field for its application, but it can hardly be expected that it will be of use on our own railway systems. There would undoubtedly be a great advantage in being able to communicate directly with a train in motion from the stations along the route, but any such system of communication, in order to be of real value, would have to possess qualities which are not greatly in evidence in radio-telegraphy.

In this connection a correspondent points out the bearing that some experiments described in the Electrical Review of February 5th (page 208), of this year, may have on the subject. In an extract from *L'Industrie Electrique*, which described a method made use of by Mons. L. Neu for the purpose of demonstrating the practicability of communicating over power lines by means of high-frequency currents superimposed on the power currents, it was shown how what appears to be a very feasible method of signalling might be practically employed. The electrification of our railways is making progress, especially in the suburban districts, and since we have here communication already established with a moving train in the power current itself, it would seem that there is a distinct opening for the application of some such method as that described by Mons. L. Neu. In the district round London, where during certain seasons of the year fogs have to be contended with, it might be advantageous to possess a signalling system which would not be affected by atmospheric conditions. Some difficulty might be found, when the traffic was congested, in confining the messages to their intended recipients—the same difficulty, in fact, that is met with in wireless telegraphy; but this might possibly be overcome by similar means—namely, by tuning.

Tramway Employment.

We have already referred in our "Tramway Notes" to the strike that has been in progress on the system of the London United Tramways. Perhaps in the ordinary course we should not have referred further to the subject except to record the settlement of the dispute and the terms thereof; but there have been sent to us, whether by the company itself or by the representatives of the men we know not, copies of the *Thames Valley Times* of April 14th and of the *Surrey Comet* of 17th inst., in which the one matter of supreme importance, dealt with at great length, is this unfortunate friction. Experience teaches us that we are desired to say something concerning the position that has arisen, and so we have endeavoured on another page to refer quite impartially to statements emanating from both sides, as apparently exhaustively set out in the papers before us, and leave our readers to make their own deductions therefrom.

In doing this, however, we feel compelled to remark that we are occasionally inclined to be suspicious when authorities find it necessary to indulge in flowery language—call it "gush" if you will—concerning the very cordial relations that have existed between themselves and their employés, especially when one has heard for years undertoned rumblings of discontent. Generally speaking, it may be accepted that if relations are in every way satisfactory it will not be necessary to announce the fact—it will speak for itself. Upon the men themselves the effect can only be irritating, for they know better than anybody else whether they are a happy family or not. If they are not so the public are bound to find it out, however many grandiloquent announcements managements may make to the contrary with the view to staying the progress of ferment, for to retain the confidence of shareholders and the watchful spirits on the Stock Exchange.

Far be it from our desire to lend the slightest support to any body of men on strike. Our views on the subject of strikes are well known. Nor need we say that the presence of the agitator firebrand type of man is very undesirable, and must work havoc upon the satisfactory operation of a tramway system, but the employés are men who have interests of their own, and they should be afforded reasonable opportunity for lodging petitions or complaints on their own and their fellows' behalf, without feeling that the effect upon their own employment will be fatal. If there are wrongs, it is in the interests of the whole body of shareholders and employés, that they should be inquired into in a calm, unprejudiced way, with the simple desire of meting out common justice. It is futile to expect that any great system can be operated peacefully, safely, or with reasonable profit, if when representations are made, there is held aloft a sword of Damocles destined to fall at a convenient moment. There can be no contentment in employment which robs a man of all interest in himself, makes a mere puppet of him or treats him as but a pawn in a game, or a little bit of mechanism in a machine with no liberty of action, and allows him no self-respect. What sort of men can you expect to retain if this be the "stuff" that they are to be made of?—not men of the nerve and alertness that are required for the operation of a system of modern electric tramcars. Suppression is not discipline, and it will not hold together a capable body of *men*. The days of ignominious servility are past, and the sooner that fact is recognised by all the better will it be for most of us, whether we be capitalists or no. We admire the man who is born to organise and to control undertakings employing large bodies of men, but tactful and considerate handling and wise diplomacy are among the leading qualifications called for in such high offices if they are to be successfully filled.

D

THE SUPPLY OF ELECTRICAL ENERGY FOR POWER PURPOSES IN CONNECTION WITH TRACTION SUPPLY SYSTEMS.

By ARTHUR IMBERY.

With the development of electric tramways many persons have become deeply interested in the applications of electricity for lighting and power purposes, which have in turn no doubt produced a stimulating effect on the electrical industry generally. Considering personal advertisement as one of the best forms of advertising (on the assumption that one satisfied consumer generally means another), one is not surprised to receive applications for electricity from some of the most remote parts of a borough.

Until recently it has been commercially impossible to supply this class of consumer, owing to the capital expenditure required being so great that it makes the cost of laying mains, &c., prohibitive. This difficulty has now to a certain extent been overcome by the Board of Trade allowing consumers to obtain a supply from the traction system, provided certain rules and conditions are observed. This sanction has had a beneficial effect both on the supply company and on the consumer, as it has enabled the former to increase their load factor, with a corresponding reduction in works costs, whilst the latter has been able to obtain cheaper power than would otherwise be possible.

In making arrangements with such consumers for the supply of electricity, it should be clearly defined that the supply company or corporation cannot guarantee an uninterrupted supply, owing to the feeder circuit-breaker at the works sometimes operating and cutting off the supply on that particular feeder, due to trolley wires falling and earthing, careless driving, short circuits on cars, or excessive overloading of the feeder. However, in actual practice little difficulty is experienced in this direction, as the circuit-breakers on the cars are overhauled each day, and kept in thorough working order, and are adjusted to operate at considerably lighter loads than the time-limit breaker at the generating station.

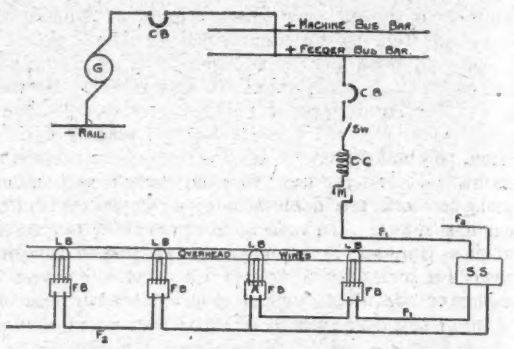
Falling trolley wires are of such rare occurrence that this trouble may be practically neglected. Several consumers have had a supply for six months without a single failure of supply, and only one consumer has had to shut down his works (engineering works), this being due to a fault on the feeder.

This particular consumer originally derived his power from a gas engine and suction plant; but owing to the cracking of the boss of the fly-wheel, he obtained a supply from the traction system until the necessary repairs could be completed. A motor-generator set was installed in his premises in order to reduce the traction pressure to a pressure suitable for his motors, which were installed throughout the works. He was delighted with the electric drive, and his power bill was so low, that he has now sold his gas engine. Any further comment on the superiority of the electric drive would be superfluous.

For small consumers motors are lent on hire at a low rate of interest, enabling the consumer to save a certain amount of capital expenditure, which to a man in a small way of business is a considerable item. His power is always ready at hand, and he is in no way dependent on fluctuations in the price of coals, or on obtaining punctual deliveries. By reading his meter he can readily ascertain what his power charges are likely to be. Should his motor break down he has only to telephone to the works (where a stock of motors are always on hand), and his motor is immediately repaired or another installed, whereas with a steam engine or gas engine, several days may elapse before the repairs are completed.

There are several methods of feeding traction circuits, but these are more or less alike in principle. Fig. 1 is a diagram showing the necessary connections for feeding one section. It will be noticed that the feeder is connected with a sub-station marked S S. To this sub-station several other traction feeders are connected, so that in the event of trouble on any particular feeder, by an arrangement of switches this faulty feeder can be cut out of circuit, and the healthy circuit switched over to another feeder in order to maintain the supply. In addition the feeders may be connected in parallel if necessary, in order to boost up any overloaded feeder, either at the sub-station or at any of the points between feeders, as shown at point A (see fig. 1).

In this feeder box a time-limit circuit breaker is sometimes installed in order to connect the two feeders in parallel, in case of extra heavy traffic. Of course, should any serious



C B, Circuit breakers; S W, Quick-break knife switch; C C, Choking coil and lightning arrester; M, Watt-hour meter; F1, F2, Traction feeders; S S, Sub-station; F B, Feeder box; L B, Line breaker.

Fig. 1.

fault occur on either feeder, the breaker in the box operates and isolates the faulty section, the latter then being cut dead by the operation of the feeder circuit breaker at the works.

Several types of feeder and section boxes are in operation, a common and simple type of feeder box being shown in fig. 2. The section boxes are similar to the feeder boxes with the exception that no knife switches are necessary.

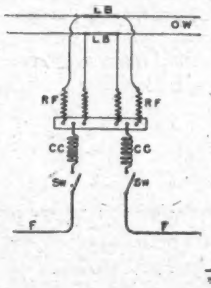
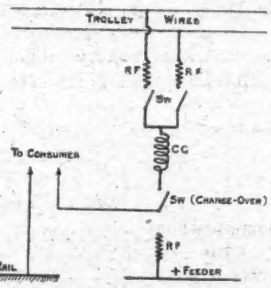


Fig. 2.



L B, Line breakers; O W, Overhead wires; F, Feeder; R F, Replacement fuses; S W, Switch; C C, Choking coil and lightning arrester.

Fig. 3.

It is advisable when connecting large consumers to the traction supply to install a special pillar box, so that the consumer can have a supply of electricity in the event of a fault on the feeder or a fault on the overhead.

It is better, however, to work with his supply connected to the feeder, as the feeder being of greater sectional area than the trolley wire, the drop in volts is not so great for the same load, especially if his service be tapped off the overhead at a point some distance away from a feeding point. It will be noticed from fig. 3 that the consumer can be connected to the trolley wire or feeder by the operation of the change-over switch, provision being made for connecting the consumer to either trolley wire in the event of one being made dead for any purpose.

The addition of a pillar box of this description is well worth the initial capital outlay required, for should no pillar box be installed, it then becomes necessary to fix the cut-outs at such a height above the ground that a ladder or a tower wagon is necessary when refixing fuses. The consumer also has the advantage that he can cut off the supply to his premises when inserting fuses or doing any repairs, by opening the switch in the pillar box.

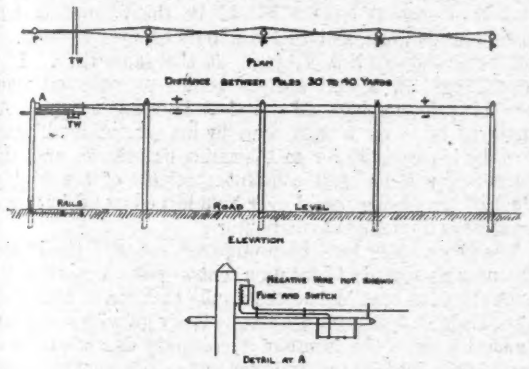
When a consumer intends installing his own motors, it is advisable to install a recording voltmeter, in order to obtain a record of the true pressure at that point. The voltmeter should be left on the consumer's premises for three or four days and the sheets compared. The average pressure for the hours when the consumer will be likely to require current can then be obtained by the use of a planimeter or other suitable

instrument. This procedure enables the consumer to obtain a motor suitable for the pressure, and in this manner the average speed of the motor is well within the consumer's requirements.

Should the speed be unsatisfactory, adjustment can be obtained by alteration of the brush position, but this method reduces the efficiency of the motor, and if it is carried to excess destructive sparking at the brushes will result. For constant-speed work the shunt-wound motor is undoubtedly the best type to adopt, whilst for crane work, locomotives, &c., where the starting torque required is very great, series-wound motors offer special advantages. For variable speed, the shunt-wound motor regulated by variation of field excitation is fairly economical and satisfactory.

The Board of Trade allow the service wires for consumers to be overhead or underground, and for short distances the latter method is cheaper, as it is not necessary to fix any poles or trouble about any overhead equipment. When the service wires are overhead, special precautions are necessary.

From fig. 4 it will be noticed that the service wires (when bare copper is employed) are attached to bracket arms fixed on the poles at different levels; this enables the wires to be



P, Poles; T W, Trolley wires.

Fig. 4.

crossed as shown, the poles being sufficiently near together to prevent the wires touching each other, due to any sag or wind pressure.

This method of crossing the wires prevents the possibility of any wire falling and remaining alive, as the wires coming in contact being of opposite polarity, a short-circuit is established and the positive fuse in the box shown in fig. 4 is blown and the circuit made dead. In services off the traction supply, it is advisable not to fuse the negative wire (except in the consumer's premises), for should any fault or short-circuit occur, the negative wire being continuous the positive fuse under these conditions would always blow and isolate the circuit.

It will be noticed that the metal pole itself may be used as part of the return circuit (negative), provided the return wire be well bonded at the top and bottom of the pole.

Installation Notes.—To comply with the Board of Trade Regulations (1905) special precautions are necessary when installing plant for medium pressures (*i.e.*, pressure exceeding 250 volts but not exceeding 650 volts). A few extracts from the Board of Trade Regulations on the subject at this stage may be of interest :—

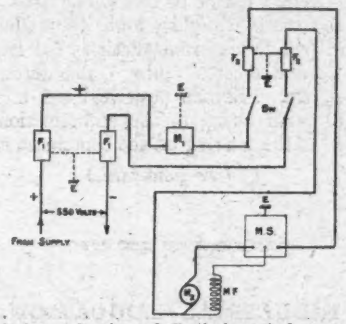
Motors.—1. The frame of every electric motor shall be efficiently connected to earth.

2. The consumer's wires forming the connection to motors, or otherwise in connection with the supply, shall be, as far as practicable, completely enclosed in strong metal casing efficiently connected with earth, or they shall be fixed in such a manner that there shall be no danger of any shock.

3. The supply to every motor shall be controlled by means of an efficient cut-off switch, placed in such a position as to be easily handled by the person in charge of the motor, and connected so that by its means all pressure can be cut off from the motor itself, and from any regulating switch, resistance, or other device in connection therewith.

4. Switches, efficient fuses, or other automatic circuit-breakers shall be provided, so as to protect the circuits from excess of current, and all switches and cut-outs shall be enclosed and protected so that there shall be no danger of any shock being obtained in the ordinary handling thereof, or of any fire being caused by their normal or abnormal action.

5. A notice shall be fixed in a conspicuous position at every motor and switchboard in connection with the supply



All wiring to be in metal casing and effectively earthed. M, Meter; S W, Main switch (double pole); M S, Motor starter; M_2, Motor; M F, Motor field; F_1 F_1, Supply Co.'s fuses; F_2 F_2, Consumers' fuses; E, Earth connection.

Fig. 5.

forbidding unauthorised persons to touch the motors or apparatus.

To observe Rule 4, all motor frames, motor-starters, fuses, &c., should possess metal covers, which should be efficiently earthed.

In this manner it is impossible to obtain a shock from the motor or apparatus in the ordinary handling thereof. The earth connections to the cut-outs, &c., should be made through barrel connectors, in order that the earth wire can be easily disconnected when inserting fuses and thus obviate any possibility of a short-circuit or dangerous shock.

Fig. 5 is a diagram of connections of a typical installation fed from the traction supply. In the manufacture of motors for working on traction supply systems, special attention should be given to the insulation of the various parts. This is due to the negative pole generally being at earth potential, thus throwing considerably more strain on the insulation of the machine than would otherwise be the case when working across the outers of a three-wire direct-current supply. All motors, &c., should be severely tested before leaving the works, as this, in a good many cases, prevents trouble and inconvenience afterwards.

The motor frame should be earthed, and the starter arm of the motor rheostat placed in the "full on" position, the main switch then being closed. The motor armature (being of very low resistance) under these conditions practically forms a short circuit across the supply and blows the fuses. Several motors which have come under the author's notice have developed faults of some description when subjected to this "short-circuit" test. It is quite possible that a motor may be subjected to a test of this description in actual practice, should the starter arm fail to release, and not be noticed before closing the main switch on restarting the motor.

Special attention should be given to the design of the cut-outs adopted for use on traction circuits. Considerable trouble was at first experienced, owing to the arc produced on the fuse operating getting on to the metal cover of the fuse, and in this manner maintaining the arc, destroying the cut-out and blowing the main fuse, which in some cases was of about ten times the capacity of the circuit fuse. To obviate this, stranded fuses in asbestos cord were employed, the cut-out then being tightly packed with asbestos shavings. However, in actual practice this did not appear to be much superior to the old type.

From a series of tests it was discovered that the distance between the fuse contacts was not sufficiently great for use on this high voltage. The contacts were accordingly altered, with very satisfactory results. *En passant*, it may be mentioned that blowing a three-ampere fuse (distance between fuse contacts 3½ in.) as a "short" across a 550-volt supply, blew a 100-ampere fuse which was in series with it. It is assumed by many engineers that this phenomenon is due to the "surging effect" produced by a

THE SUPPLY OF ELECTRICAL ENERGY FOR POWER PURPOSES IN CONNECTION WITH TRACTION SUPPLY SYSTEMS.

By ARTHUR IMBERY.

With the development of electric tramways many persons have become deeply interested in the applications of electricity for lighting and power purposes, which have in turn no doubt produced a stimulating effect on the electrical industry generally. Considering personal advertisement as one of the best forms of advertising (on the assumption that one satisfied consumer generally means another), one is not surprised to receive applications for electricity from some of the most remote parts of a borough.

Until recently it has been commercially impossible to supply this class of consumer, owing to the capital expenditure required being so great that it makes the cost of laying mains, &c., prohibitive. This difficulty has now to a certain extent been overcome by the Board of Trade allowing consumers to obtain a supply from the traction system, provided certain rules and conditions are observed. This sanction has had a beneficial effect both on the supply company and on the consumer, as it has enabled the former to increase their load factor, with a corresponding reduction in works costs, whilst the latter has been able to obtain cheaper power than would otherwise be possible.

In making arrangements with such consumers for the supply of electricity, it should be clearly defined that the supply company or corporation cannot guarantee an uninterrupted supply, owing to the feeder circuit-breaker at the works sometimes operating and cutting off the supply on that particular feeder, due to trolley wires falling and earthing, careless driving, short circuits on cars, or excessive overloading of the feeder. However, in actual practice little difficulty is experienced in this direction, as the circuit-breakers on the cars are overhauled each day, and kept in thorough working order, and are adjusted to operate at considerably lighter loads than the time-limit breaker at the generating station.

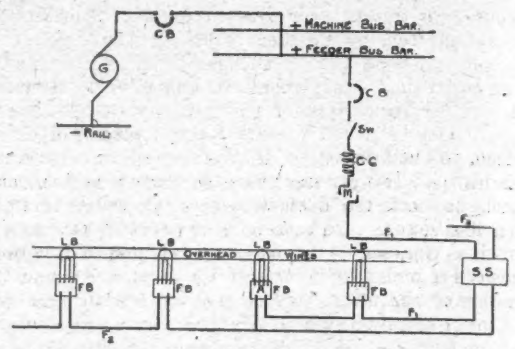
Falling trolley wires are of such rare occurrence that this trouble may be practically neglected. Several consumers have had a supply for six months without a single failure of supply, and only one consumer has had to shut down his works (engineering works), this being due to a fault on the feeder.

This particular consumer originally derived his power from a gas engine and suction plant; but owing to the cracking of the boss of the fly-wheel, he obtained a supply from the traction system until the necessary repairs could be completed. A motor-generator set was installed in his premises in order to reduce the traction pressure to a pressure suitable for his motors, which were installed throughout the works. He was delighted with the electric drive, and his power bill was so low, that he has now sold his gas engine. Any further comment on the superiority of the electric drive would be superfluous.

For small consumers motors are lent on hire at a low rate of interest, enabling the consumer to save a certain amount of capital expenditure, which to a man in a small way of business is a considerable item. His power is always ready at hand, and he is in no way dependent on fluctuations in the price of coals, or on obtaining punctual deliveries. By reading his meter he can readily ascertain what his power charges are likely to be. Should his motor break down he has only to telephone to the works (where a stock of motors are always on hand), and his motor is immediately repaired or another installed, whereas with a steam engine or gas engine, several days may elapse before the repairs are completed.

There are several methods of feeding traction circuits, but these are more or less alike in principle. Fig. 1 is a diagram showing the necessary connections for feeding one section. It will be noticed that the feeder is connected with a sub-station marked S S. To this sub-station several other traction feeders are connected, so that in the event of trouble on any particular feeder, by an arrangement of switches this faulty feeder can be cut out of circuit, and the healthy circuit switched over to another feeder in order to maintain the supply. In addition the feeders may be connected in parallel if necessary, in order to boost up any overloaded feeder, either at the sub-station or at any of the points between feeders, as shown at point A (see fig. 1).

In this feeder box a time-limit circuit breaker is sometimes installed in order to connect the two feeders in parallel, in case of extra heavy traffic. Of course, should any serious



C B, Circuit breakers; S W, Quick-break knife switch; C C, Choking coil and lightning arrester; M, Watt-hour meter; F_1 F_2, Traction feeders; S S, Sub-station; F B, Feeder box; L B, Line breaker.

Fig. 1.

fault occur on either feeder, the breaker in the box operates and isolates the faulty section, the latter then being cut dead by the operation of the feeder circuit breaker at the works.

Several types of feeder and section boxes are in operation, a common and simple type of feeder box being shown in fig. 2. The section boxes are similar to the feeder boxes with the exception that no knife switches are necessary.

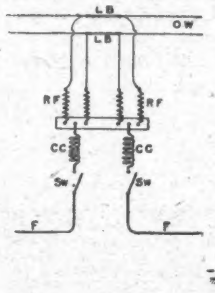
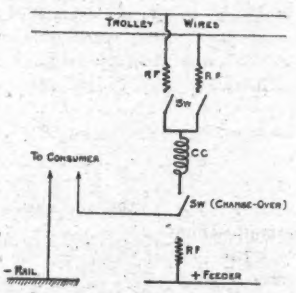


Fig. 2.



L B, Line breakers; O W, Overhead wires; F, Feeder; R F, Replacement fuses; S W, Switch; C C, Choking coil and lightning arrester.

Fig. 3.

It is advisable when connecting large consumers to the traction supply to install a special pillar box, so that the consumer can have a supply of electricity in the event of a fault on the feeder or a fault on the overhead.

It is better, however, to work with his supply connected to the feeder, as the feeder being of greater sectional area than the trolley wire, the drop in volts is not so great for the same load, especially if his service be tapped off the overhead at a point some distance away from a feeding point. It will be noticed from fig. 3 that the consumer can be connected to the trolley wire or feeder by the operation of the change-over switch, provision being made for connecting the consumer to either trolley wire in the event of one being made dead for any purpose.

The addition of a pillar box of this description is well worth the initial capital outlay required, for should no pillar box be installed, it then becomes necessary to fix the cut-outs at such a height above the ground that a ladder or a tower wagon is necessary when refixing fuses. The consumer also has the advantage that he can cut off the supply to his premises when inserting fuses or doing any repairs, by opening the switch in the pillar box.

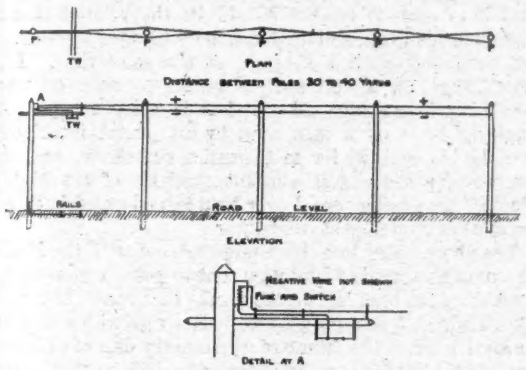
When a consumer intends installing his own motors, it is advisable to install a recording voltmeter, in order to obtain a record of the true pressure at that point. The voltmeter should be left on the consumer's premises for three or four days and the sheets compared. The average pressure for the hours when the consumer will be likely to require current can then be obtained by the use of a planimeter or other suitable

instrument. This procedure enables the consumer to obtain a motor suitable for the pressure, and in this manner the average speed of the motor is well within the consumer's requirements.

Should the speed be unsatisfactory, adjustment can be obtained by alteration of the brush position, but this method reduces the efficiency of the motor, and if it is carried to excess destructive sparking at the brushes will result. For constant-speed work the shunt-wound motor is undoubtedly the best type to adopt, whilst for crane work, locomotives, &c., where the starting torque required is very great, series-wound motors offer special advantages. For variable speed, the shunt-wound motor regulated by variation of field excitation is fairly economical and satisfactory.

The Board of Trade allow the service wires for consumers to be overhead or underground, and for short distances the latter method is cheaper, as it is not necessary to fix any poles or trouble about any overhead equipment. When the service wires are overhead, special precautions are necessary.

From fig. 4 it will be noticed that the service wires (when bare copper is employed) are attached to bracket arms fixed on the poles at different levels; this enables the wires to be



P, Poles; T W, Trolley wires.

Fig. 4.

crossed as shown, the poles being sufficiently near together to prevent the wires touching each other, due to any sag or wind pressure.

This method of crossing the wires prevents the possibility of any wire falling and remaining alive, as the wires coming in contact being of opposite polarity, a short-circuit is established and the positive fuse in the box shown in fig. 4 is blown and the circuit made dead. In services off the traction supply, it is advisable not to fuse the negative wire (except in the consumer's premises), for should any fault or short-circuit occur, the negative wire being continuous the positive fuse under these conditions would always blow and isolate the circuit.

It will be noticed that the metal pole itself may be used as part of the return circuit (negative), provided the return wire be well bonded at the top and bottom of the pole.

Installation Notes.—To comply with the Board of Trade Regulations (1905) special precautions are necessary when installing plant for medium pressures (*i.e.*, pressure exceeding 250 volts but not exceeding 650 volts). A few extracts from the Board of Trade Regulations on the subject at this stage may be of interest :—

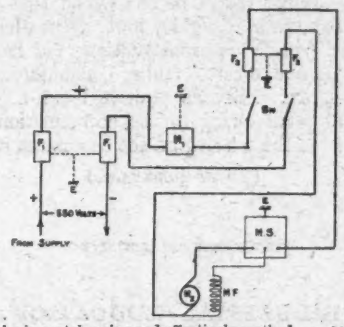
Motors.—1. The frame of every electric motor shall be efficiently connected to earth.

2. The consumer's wires forming the connection to motors, or otherwise in connection with the supply, shall be, as far as practicable, completely enclosed in strong metal casing efficiently connected with earth, or they shall be fixed in such a manner that there shall be no danger of any shock.

3. The supply to every motor shall be controlled by means of an efficient cut-off switch, placed in such a position as to be easily handled by the person in charge of the motor, and connected so that by its means all pressure can be cut off from the motor itself, and from any regulating switch, resistance, or other device in connection therewith.

4. Switches, efficient fuses, or other automatic circuit-breakers shall be provided, so as to protect the circuits from excess of current, and all switches and cut-outs shall be enclosed and protected so that there shall be no danger of any shock being obtained in the ordinary handling thereof, or of any fire being caused by their normal or abnormal action.

5. A notice shall be fixed in a conspicuous position at every motor and switchboard in connection with the supply



All wiring to be in metal casing and effectively earthed. M, Meter; S W, Main switch (double pole); M S, Motor starter; M_0, Motor; M F, Motor field; F_1 F_2, Supply Co.'s fuses; F_3 F_4, Consumers' fuses; E, Earth connection.

Fig. 5.

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heavy instantaneous rush of current, which in turn produces a high difference of potential in the circuit.

Most satisfactory results were also obtained by the use of circuit breakers inserted in series in the negative wire, as a fuse having more or less of a time limit, and the breaker being instantaneous in operation, the latter operated and prevented the fuses being blown, with a corresponding saving of time. Of course, it will be understood that the breaker is adjusted to work at a slightly lower value than the fuses.

The majority of faults in installations fed from the traction supply are due to earth faults, commutator and brush gear troubles, &c. Several positive brush-holder spindles have gone to earth owing to the accumulation of copper dust, &c., due to the wearing of the commutator.

(*To be concluded.*)

INDUSTRIAL EDUCATION.

By THEODORE RICH.

It is generally assumed by the economists and educational authorities of this country that one of the main reasons for the falling-off in position of the industrial and trading interests, relative to those of other countries, has been the lack of technical education among the organising and working classes. This is to a certain extent true, but there have been other factors at work which are not usually recognised. Fifty years ago Great Britain had a unique position among the industrial countries of the world. The steam engine, the lathe and other machine tools, the spinning and weaving machines, had been developed by Englishmen, and the English manufacturer was able to obtain almost a monopoly in many of the markets of the world, by reason of the superior skill of the operatives and the quality of the materials produced. A great change has taken place within the last thirty years, and the demand for highly-skilled labour has decreased and the demand for semi-skilled labour increased, so that nowadays, with the aid of automatic machinery, an American negro or low-caste Indian native can turn out work that 50 years ago required the services of the highest-skilled workman.

The demand for cheap goods increases every day, and the masses now look upon as necessities of life things which used to be considered as the requirements of the middle and upper classes only. Countries which at one time had a supply of labour suitable for the lowest classes of agricultural work can now compete with those having the oldest established industrial organisations. The nation that will lead the industrial and trading world of the future is that which has the largest supply of semi-skilled labour coupled with the best technically and commercially educated middle classes to organise the work. The demand of the trades unions for a standard wage, regardless of the skill of the operative, has tended to lower the standard of workmanship, as, despite the theories of the Socialists and other political dreamers, a man will not take much extra care in his work unless there is some likelihood of an extra reward, and, apart from the positions of leading hand or foreman, the giving of any extra pay by the employer for good work is looked upon by the trade union officials as one of the worst forms of bribery. There is the further difficulty that owing to the stress of competition, foremen are chosen as much for their organising capacities as for their skill as workmen, and this former attribute is not one that can be learned at technical schools. During the last few years, a large number of continuation and evening schools have been started by the county councils and other public bodies, but in most cases it is the lower middle class student that has taken advantage of the facilities afforded, and not the working classes for whom these schools were primarily intended.

There is a growing desire among educational authorities to increase the age limit for compulsory attendance at school, with a view towards the increasing of the technical education given, and this view is supported by the trades unions, not with a view to the improvement of the skill of the workmen, but in order to reduce the amount of non-adult labour, and thereby (in accordance with their fallacious views on political economy) increasing the amount of the wages earned by the full member. For training the workman the technical school can never supplant the workshop, and though handicraft training can be given to a considerable extent, the most important elements of time and output must necessarily be absent, and the system that is likely to give the best results is a combination of part time apprenticeship and compulsory attendance at technical schools.

In all classes of educational work it is a very difficult matter to resist the temptation to carry on the work to suit the intelligence of the best students in each class, and not that of the average and indifferent students. The smart boy can to a great extent get on by himself, and requires much less teaching than one of average intelligence; and while no obstacle should be put in his way, and facilities should be given for higher training, it is the boy of average intelligence to-day who will be the workman of to-morrow.

There is still too much tendency to teach academic subjects—pure mathematics, pure science. It should be remembered that pure science without the knowledge of application is of very little use to the average student, and the test of a good teacher should be the interest that he arouses in his work, and this can only be done by teaching the pure and applied subjects at the same time. It is astonishing how a dull student begins to wake up when something interesting and practical is being taught. An employer takes on a man more by his general intelligence than by his capacity for mathematics or science, and this accounts for the almost constant spectacle of the highly-educated man being passed over by a less educated but more practical and intelligent competitor.

The above notes have been prepared, not with the idea of discouraging technical education, but to point out that too much store has been laid on the results that can be obtained; a knowledge of science does not always go with a capacity for hard work. The future of the country depends more on the general intelligence, industry and thrift of the people than on any exact knowledge of the working classes of the arts and sciences.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Expansion of German Trade.

A letter signed "Anti-Bunkum" recently appeared in the columns of the *Westminster Gazette*, and, as the writer dealt chiefly with matters concerning the electrical industry, his views will not be without interest to readers of your columns. Electrical engineers who glanced at the prospectus of "Victoria Falls and Transvaal Power Co., Ltd.," would not fail to notice among the list of directors the name of Geheimrat E. Rathenau, the creator and controller of the A.E.G., and some might wonder why his name should appear on the board of this English company. The answer, according to the writer of the letter referred to, is that the A.E.G. is supplying the whole or nearly the whole of the machinery, costing between £1,000,000 and £2,000,000 sterling, and has guaranteed to find the greater part of the debenture, and probably also of the share capital of the company. He asks, How is it that no British company or group of companies could be found to take the place of the German concern? and he proceeds to answer his own question.

In manufacturing for export the Germans are at a disadvantage in one respect owing to their import tariff. According to the best German authorities, says this writer, England has an advantage of at least 5 per cent. by virtue of her free imports, and this, notwithstanding the cheaper labour and longer hours of work.

The principal advantage which the Germans have over English manufacturers is in the difference in the nature of the balance sheets of the great manufacturers in the two

countries. According to "Anti-Bunkum," in the huge German electrical concerns there is absolutely no watered stock; all patents, privileges, and trade-marks are placed at 1 mark; goodwills, for which large sums are often paid, are invariably wiped out; and all experimental plant and rapidly wearing tools and plant are paid for out of revenue. On the other hand, reserves are in immediately convertible securities or in cash. It is often said that the German banks finance the great industrial concerns, but the writer of the letter from which I am so freely quoting, says that these great companies more often lend to the banks than borrow from them, and some of them, including the A.E.G., can pay dividends for years without making a shilling profit on their share capital.

Other advantages which the Germans possess are in the methods of management and superior organisation; the high class of men employed as commercial travellers; the superiority of the German consular system; the lower railway freights, particularly for export, and the comparative absence of legal formalities and expenses in connection with contracts.

Referring particularly to the A.E.G., the writer points out that it has a reserve fund of £4,000,000; it controls one bank, and half controls two others; it could find £2,000,000 at a week's notice, and, if necessary, could probably find £10,000,000.

As to business methods, these are aggressive and audacious in their character, more particularly in connection with foreign business. Two average examples are given, briefly as follows:—(1) If an A.E.G. agent reports that an electric tramway, say in a town in Spain, Argentina or Chile might be a profitable undertaking, an expert is sent over and a complete scheme is laid before capitalists, the A.E.G. intimating that it is prepared to carry out the work and to guarantee certain results, agreeing to receive no payment until these results are secured. If necessary, the A.E G. guarantees a debenture issue, if sufficient capital is not forthcoming. In this way millions of German money has gone to South America, European countries, and to British colonies. (2) In connection with the electrification of collieries, works, &c., a somewhat similar method is followed. Thus, an agent goes to a colliery owner and shows him that by spending, say, £35,000 on new plant, he would save £10,000 a year. His company, the A.E.G., is prepared to put down the plant and run it for six months without charging anything in the meantime. If it does not fulfil the conditions, the owner need not pay for it; in other words he can have the plant on appro.

It is, of course, obvious that to carry on a policy of this kind, a company must employ absolutely tip-top men who are specialists in the branch of work they control; and men of this calibre must be paid adequately and given a free hand; but I know of young and highly educated men in England, with engineering qualifications after their names and speaking one or more Continental languages, who are paid no higher salary than a first-class fitter can command as wages by the firms who employ them.

I have quoted pretty freely and without comment from "Anti-Bunkum's" letter, and will conclude with a literal quotation from his closing sentences: "It will now be understood what British firms have to compete against, and why no British firm had the strength or pluck, or the two combined, to carry through the magnificent scheme of the Victoria Falls Company." Tis true, 'tis pity, pity 'tis, 'tis true!

Consultant.

English v. German Enterprise.

My attention has been drawn to an article in your issue of April 9th with reference to the above. I wish that it were possible for the facts stated by you to be known throughout the length and breadth of the country.

On reference to the *Daily Telegraph*, of April 7th, 9th and 15th, you will find that I have directed the attention of the public to the matter to which you refer, and you will be pleased to hear that as a result of this correspondence there seems every probability of the proposal contained in my first letter taking definite shape.

With the enormous future there is before the electrical industry, it is absolutely essential that the finance be arranged for, otherwise we shall see the whole of our own electrical orders going outside this country. It is, in my opinion, only a matter of time before the electrification of the whole railway system in this country is effected.

At the present moment it would be impossible for the English electrical industry to undertake such a work as this would involve, but it would not be beyond the scope of our German competitors, and it behoves the whole industry to set its house in order and prepare for such eventualities.

Will. H. Benett-Dampier.

London, S.W., *April 15th*, 1909.

[With regard to the last paragraph of the above letter, it must not be inferred that British electrical firms have not the equipment necessary for undertaking large orders. —Eds. E.R.]

500-Volt Direct-Current Generators.

We have two 230-kw. direct-current six-pole generators with interpoles, and after running for some few months on the town load, we find that at six regular intervals on the commutators there are marks which develop eventually into flats. After these flats have been removed and the generator run again for some time, these marks come up again just in the same places. We find that the position of the brushes (angle of lead) does not influence these marks. The armatures are parallel wound, with slotted cores. We have also another large generator which shows four dull segments and one bright one all the way round the commutator, but this has no interpoles and is a series-wound armature. Any observations will much oblige.

Reyert.

Mercury Motor-Meters.

It has been noticed that a certain type of mercury motor-meter, of modern manufacture, appears to require a lower starting current when supplied with current off a testing battery than when coupled to the voltage of supply; the voltage of the testing battery is 20 volts, and that of the supply 240 volts.

The meters start and run satisfactorily with ·08 ampere when coupled to the battery, but when changed over to the voltage of supply, refuse to start with less than ·4 ampere; they are of 5, 10 and 25-ampere capacity, and this peculiarity has been noticed with these various sizes. The meters have been carefully examined, and no electrical or mechanical defects in construction are apparent. Again, it has been noticed that the same meters, especially those of 5-ampere capacity working on variable lighting circuits, run for a period and register about 10 to 20 units, and then, for no apparent reason, stop; but when these are taken off the voltage of supply and put on a battery circuit, they start and run without any trouble.

The theory has been advanced to me that it is a question of current density, and I should be glad to hear from any of your readers if such is the case, or of any other explanation for the peculiar behaviour of these meters.

Strebor.

Testing Live Cables.

Mr. Allen's paper "On Testing the Insulation Resistance of Live Cables on Direct-Current Systems," an abstract of which you published in your issue of the 16th inst., claims that, by the system described, the insulation resistance of each cable in any section of the mains can be determined without interfering in any way with the working of the system. The method of testing described by Mr. Allen only differs from one of the earliest voltmeter methods by the substitution of a testing set for the voltmeter originally used; but it was never claimed for this old method that it could do more than measure the joint fault resistance of all the cables and apparatus connected to one or other pole of the dynamo.

It would therefore be most interesting if Mr. Allen would amplify his paper by explaining how he separates the fault resistances X and Y of the particular section under test from those of the rest of the circuit; as, if there is no interference in any way with the working of the system, so that all the sections are connected through the main cables to the dynamo, X will be a measure of the joint resistance of the leakage circuits from all the cables, both main and sectional, connected to one pole of the dynamo, and of the leakage circuits from the same pole of the dynamo itself and from any switchgear connected thereto.

Stuart A. Russell.

April 17th, 1909.

The Same Old Game.

Referring to "Sulphuric's" article "The Same Old Game," I feel confident that his case is an isolated one, especially amongst electrical engineers.

I have been calling on all our engineers of note throughout these past two years, and not once has the suggestion of a bribe taken place.

I have successfully transacted some capital business, and can meet competition from almost any point, but have always found the engineer on the look-out for a good thing, for which he does not mind paying a fair price. Therefore the man who is open to accept a bribe, *i.e.*, probably 10 per cent. tacked on the cost price, is not doing justice to the company of electrical engineers who has entrusted him with the honourable position of buyer.

E. W. Luetchford.

London, N.E.

Combined Track Circuit and Cab Signalling.

I feel sure that you and your readers will by now be of the opinion that your space may be much better occupied than by carrying this correspondence further, especially as it appears to be about to degenerate into a mere wrangle. I do not, therefore, intend to deal with Capt. Gardiner's letter in your issue of the 16th inst. So far as I am concerned, the correspondence is closed.

The Writer of the Article.

Supply by Meter, or Contract?

I do not think Mr. Goddard can have seen any travellers for *mercury* motor-meters lately. For the last year or two they have been quite anxious to talk about $\frac{1}{20}$th load. I expect his letter will result in manufacturers enlightening him on this point, so I will not strain the editorial courtesy by giving anyone a free advertisement. Meter-makers have been very modest in this correspondence up to now, but I expect Mr. Goddard's letter will be too much for the self-restraint of some of them. Anyhow, I can definitely state that I have seen many tests—*not* on picked samples—carried down to starting current and the accuracy still remaining within limits.

Unonot.

Canadian Electrical Trade.

I shall be glad if you will allow me to challenge a statement quoted in your issue of March 12th, which, if allowed to pass uncontradicted, may mislead manufacturers anxious to enter the Canadian market. I refer to the excerpt (under "Business Notes") from the periodical *Canada*, in which the writer states that "Inasmuch as there is comparatively little variation in electrical appliances and accessories in use in Canada from similar items in England, the British maker should find a wider trade with ordinary attention to the market." So far as the lighting section of the electrical industry is concerned, this statement is absolutely misleading, and with your permission I will point out a few of the principal points of difference between English and Canadian practice.

Wiring Systems.—I suppose that probably 80 per cent. or more of the wiring in England is now carried out in conduit of one form or another. In Canada I am sure I am within the mark in stating that quite 90 per cent. is "knob and tube" work. Conduit is being used in the new buildings of fireproof construction, but this conduit must meet the requirements of the fire underwriters' code, which calls for a thickness of wall equal to that of gas pipe of corresponding size, and this requirement (unless the conduit situation has altered very materially in my three years' absence from England) would effectually bar the majority of English conduits.

Wire.—English practice is, I believe, to use stranded wire wherever possible, in preference to solid wire, and I do not think many contractors would use anything heavier than 1/16 solid, if it could be avoided. Here, 1/14 is the smallest wire permitted to be used on any job, even for a single light, and as the capacity of branch circuits is restricted to 660 watts, the result is that 1/14 solid wire (B. & S. gauge) is the only size used on any ordinary job, except a few feet of No. 8, 10 or 12 for mains.

Lamp Holders.—The bayonet joint holder, practically universal in England, is almost unknown here. Edison screw holders (called sockets) are in most general use, though some Thomson-Houston and Westinghouse patterns are carried by all dealers.

Switches.—Circuit switches here are almost universally Perkins turn or snap switches for ordinary work. For better work, large residences, public buildings, &c., flush switches, either turn or push button, are the only alternative. The tumbler switch, as used in England, does not comply with the underwriters' requirements, though I see no reason why it should not be made to do so, and it would then form a very welcome variation from the switches above mentioned.

I think these few points will serve to show that the requirements here do differ considerably from English practice, but I must confess that it is a constant source of wonder to me that the manufacturers at home do not make any serious attempt to secure a portion of the trade in accessories. Surely they are not so busy that they can afford to let a growing market like this slip past them entirely?

In an endeavour to get some manufacturers to take this matter up, I have already sent samples and details of requirements of a few lines to two firms in England, but so far without result or even acknowledgment of my letters! However, I shall be glad to furnish any other firm desirous of knowing the local conditions with any information at my disposal.

L. H. Lander.

Hamilton, Ont., *April 8th*, 1909.

The Engineer and the People.

I read with interest the above heading under "Notes," and have long thought that it is the duty of our various Institutions to take up, and settle once for all, the positions of professional engineers as distinct from mechanics.

There is no doubt that in the public mind the use of the same name for the highly-trained engineer and the mechanic workman has a great deal to do with the professional status, and it is a great pity that more pressure cannot be brought to bear upon the Institution of Electrical Engineers to do what other scientific institutions have done, *i.e.*, to make it impossible for a man to set up in practice, or call himself a consulting engineer, unless he has had the requisite training.

In my small experience of the financial world, I have been struck with the manner in which the financier exploits an engineer: with a miserable fee he pays him for most valuable information, and although the success or failure of the scheme depends entirely upon the engineer's report, and afterwards on the engineer's ability to carry out the work, yet the engineer has to be content with quite a small pittance, while the financier runs off with a small fortune.

As a suggestion, it does not seem impossible to me that all engineers should subscribe a small amount towards a Parliamentary fund, such fund to be devoted to the payment of engineering Members of Parliament, who are to represent the interests of engineers in this country.

In Parliament to-day, the Law is amply represented, and it is largely owing to the way in which lawyers have pushed their way into Parliament that their status is considered so high. However, if it became recognised by the general public that they owed everything to the engineer, and if that profession were better represented in Parliament than it is to-day, I venture to think the remarks made by your journal would be unnecessary.

Horace Boot,
Consulting Engineer to the Tunbridge Wells Corporation.

April 20th, 1909.

LONDON'S ELECTRICITY SUPPLY.

By H. F. J. THOMPSON, Chief Assistant Engineer, Battersea Borough Council Electricity Department.

It appears that considerable difference of opinion exists, amongst engineers in charge of supply undertakings in the metropolis, as to the best method to be adopted, to reap the benefits of the powers conferred on the authorised undertakers by the London Electric Supply Act, 1908. The writer hopes that the following suggestions will not add to the apparent confusion, but that they may form a basis for discussion by more able engineers and representatives of the various parties concerned, who are empowered to deal with the situation.

As is well known, the authorities at Westminster rightly reserved for the original undertakers, for a time at least, the power of giving the entire supply for the London area, for the following reasons :—

1. That all existing plant could be utilised, instead of being scrapped, as might be the case if supply were given by an independent bulk supply company.

2. That when existing plant is fully loaded, any benefits to be derived from bulk supply, should be enjoyed by the original undertakers who have done the pioneering work and built up the goodwill.

It is agreed that to effect the first move the existing stations should be interconnected, so as to make full use of spare plant, and although it would be a bold and probably unwise step to at once "link up" all stations, a definite system should be decided upon, and any portion of the work, which it would pay to carry out at once, should be in conformity with that system.

There should not be much difficulty in deciding the system to adopt, for in almost every Session of Parliament for some years past, a scheme has been put forward and discussed in detail by eminent engineers before the Parliamentary Committees. The plans and technical data are now public property, and, after due consideration, the most suitable scheme should be adopted, so that a bulk supply is available by the time the existing stations are fully loaded.

Now most engineers are naturally jealous for the welfare of their particular undertaking, and are anxious to give a supply rather than take it. However, it is obvious that all cannot be givers of supply, and, therefore, it appears the solution of the problem should be sought for on the lines of the "give-and-take" principle.

The greater portion of the supply in the London area is given for lighting purposes, and, therefore, the maximum loads at the various stations occur approximately at the same time, so to shut down completely any particular station or stations would merely increase the maximum load on the remainder, and that would probably not tend to improve the situation with the present plant. An alternative suggestion would be to arrange for a better day load, with resulting improved daily load factor, by permitting stations to be alternatively givers and takers of supply during the daytime, Sundays, &c., for certain periods during the year, to be arranged between the parties, so that the aggregate of the day loads on all the stations would provide a good day load for the stations running.

This system should tend to reduce running costs, but, of course, the financial side of the question would have to be carefully looked into, to ascertain if such saving would more than counterbalance the interest and sinking fund charges on the capital expended upon, and the cost of operating the system necessary for interconnecting the various stations.

Assuming that it were happily found that it would pay, it would undoubtedly be necessary to form a Joint Board of Control, consisting of, say :—

Members of L.C.C. (as ultimate purchasing body).

Members of local authorities owning electricity supply undertakings.

Members of electricity supply companies' boards of directors.

The board should be empowered to raise loans for expenditure on mains, &c., in connection with the transmission and distribution of the bulk supply, and for "linking up" the stations, and should appoint officials to supervise the system.

It is essential that the work of "linking up" should be in the hands of a body who would be in a position to arrange the various sections, carried out from time to time, in conformity with the agreed standard system, for otherwise there would certainly not be any incentive for any particular group of stations to "link up" on the standard and probably more costly system, other than for dealing with their isolated case ; in fact, I believe some interconnections have already been made, and are, perhaps, not on the most suitable lines, when looking at the case broadly for the supply to the whole of the metropolis.

Agreements should be entered into between the board and the various undertakers, to give and take supply at certain times and at fixed prices, so as to guarantee the standing charges and defray the cost of operating the system, and thereby each body would contribute according to the benefits it derived by giving and taking a supply.

All extensions of present stations should cease when the interconnecting system is completed, and when all spare plant is utilised, two bulk stations to be erected under the control of the board.

Turning to the engineering side of the question we are confronted with some interesting problems, but which, doubtless, in the hands of able engineers will be readily solved.

The idea, I believe, conceived by some engineers, of a simple ring main joining up all stations, is very easily drawn on paper, and it is certainly charming in its simplicity, but it would not be found without its difficulties when in operation.

The apparent trouble with such a system would probably be mitigated by arranging the stations in convenient groups, connected to "give" and "take" ring mains, with transmission cables to switch points, which latter might be situated on, or adjacent to, convenient sites for the bulk stations or advantageous points for distributing centres, when the scheme fully matured.

The above suggestions are put forward in the hope that they might be discussed by engineers and others, who have not already formed their own opinion on the subject, so that all will be working in the same direction, and thus enable the supplier and consumer to ultimately reap the benefits of the wise judgment of the Parliamentary Committees who considered the Electricity Bulk Supply Bills promoted in the past sessions.

Steam Turbine Progress.—From a report in the New York *Electrical World*, it would seem that marked progress has been made in turbine design in the United States. Discussing "Prime Movers," Dr. Steinmetz stated that there was a decrease in consumption of approximately 8 lb. or 9 lb. of steam per KW.-hour between the old steam turbines installed in the Fisk Street station, Chicago, and the new ones which are being installed. The old ones took about 21 lb. of steam, and the new ones, to the best of his recollection, take a little less than 13 lb. Incidentally, the machines are of the same size, and the rating of the station is increased some 30 per cent. without increasing the space, by simply replacing the old turbines by new units. These operate at 175 lb. and 150° F. superheat temperature. The efficiency curve is nearly flat from 75 per cent. load to 25 per cent. overload.

THE LONDON UNITED TRAMWAY STRIKE.

Both Sides.

The Men's Statement.

"The strike really arose," remarked Driver Burke, the Secretary of the Organising Committee, "from the fact that a number of the Fulwell men were dismissed the week before last because they were suspected of having joined the Vehicle Workers' Union. As a matter of fact, several of them did not belong to the Union at all, and no reason was given to any of them when they were called up to Chiswick as to why they were 'sacked.' The Union officials took the matter up, but Sir Clifton Robinson refused to acknowledge them as the men's representatives, and declined to see them. The reason why the men did not comply with his request that they should form a deputation amongst themselves was that, in the past, the members of any deputations which had approached him had been marked men. And if the concessions suggested by such a deputation were granted, we should have no guarantee that they would be maintained. The men claim that they have a right to choose their own representatives. As regards the memorial signed by many of the men, expressing devotion to Sir Clifton, it was extracted by sheer intimidation. Each man was called separately into the office of the depôt, where, in the presence of four high officials of the company, he was told to read the manifesto, and if they agreed with its terms, to affix their signatures upon a separate sheet of paper. Of course, the unfairness of this method is obvious."

The "Spotting" System.

"The men have to work from about six in the morning, possibly until midnight, for their 6s. a day," declared Driver Reames, the treasurer and organiser of the fund, in discussing the strikers' grievances. "They are not actually engaged on the car during the whole of this period, but their time is 'cut up' in such a way that they are practically unable to obtain sufficient rest to rise fresh for their duties the next day. Another important grievance is the unsafe condition of the old cars which have recently been placed on the Surrey lines. Although their defects have constantly been reported, no notice has been taken by the company, and the men contend that they are justified in refusing to take these apologies for cars out of the depôt. We also bitterly complain of the system of employing men called 'spots,' who ride about in the cars as ordinary passengers for the purpose of finding any faults in the work of the men employed. The men know that if these 'spots' cannot find legitimate faults, they manufacture them; and when reported, no matter what they may say in their defence, the men are treated as liars and suspended for anything from one to seven days. The petty tyranny of the officials is also a great source of complaint.

The L.U.T. attitude according to Sir J. Clifton Robinson, the managing director.

Sir Clifton Robinson said he had received no letter showing what grievances were alleged to exist. The whole thing had been sprung upon him. About 10 days ago he found it necessary to discharge some men who were, he considered, acting in a manner which was not in the interests of the company. "Then," he added, "I issued a memorandum to the men stating that information had reached me indirectly that there was some dissatisfaction in the ranks of the employés, and that I should be glad if they would let me know, individually or by deputation, whether such was the case. I received a memorial from each of the depôts, signed by 1,100 men, stating that they had no grievance, and that they were perfectly satisfied to leave any matter in my hands. On Tuesday last I received a letter from the Amalgamated Association of Tramway and Vehicle Workers, signed by Mr. Jack Burns, asking me to receive a deputation from the men, headed by one of the officials of the Association. Considering the memorials that I had received, I concluded that it was not for me to discuss the company's business with any representative of the Association. Therefore, I replied stating I was debarred by the rules of the company, which provide for the discussion of such matters with the men themselves. On Friday afternoon a prepaid telegram was sent to my office in Westminster, but it did not reach me until about 10 o'clock at night. It was sent by Mr. Watson, and asked me if I could see Mr. Burns and himself the following morning. To this I replied as follows: 'Have just received your telegram. Can add nothing to my letter of the 7th inst. No representation of any grievance whatever has reached me, nor has any member of the staff requested an interview, and it is with them only that I can discuss questions arising out of their employment with this company.'"

Referring to the question of wages, Sir Clifton Robinson remarked that they paid their conductors 4s. a day for the first six months and 5s. afterwards; while the drivers received 5s. a day for the first six months, and then 6s. a day, for a week of seven days, nine hours per day. "Of course," he added, "it does not follow that the men work the seven days; they are able to have time off. And I have not heard of any grievance."—*Surrey Comet.*

The following general order was issued by the directors:—

"The directors' congratulations to the staff. The board of the L.U.T. desire to place on record their recognition of the splendid services rendered by the members of the staff who have remained loyal to the company during the recent abortive attempt to create dissension amongst its

Men's statement—continued.

"Last week the men were given to understand that Sir Clifton Robinson had asserted that he would have every man cleared out of the Fulwell depôt by next October in consequence of rumours he had heard concerning their joining the Union. Last winter 40 men, principally conductors, were dismissed the company's service, and when they asked for an explanation, they were merely told that it was by order of the managing director. These men have been unable to obtain situations since, in consequence of the refusal of the company to give them references."

Surrey Comet.

Addressing a meeting in Kingston Market Place, Mr. E. Reames said the public wondered what was taking place, and he wished them to know first that the managing director went to Fulwell a week ago, and on learning that the Union was being formed, said he would have every man cleared out from there by the end of October. There were 500 men in the Union now, and they would not go back to work unless the Union was recognised by the L.U.E.T. They wanted to be able to work under fair conditions, and to be free from the petty tyranny that made their lives miserable, a tyranny of which the public knew nothing. Mr. Reames then gave details of some of the tyrannies complained of, and said that the declaration of loyalty signed by 370 out of 396 men at Fulwell, was made because those who signed knew what to expect if they withheld their signatures. Sir Clifton Robinson had said only 68 men were out on strike, but the truth was that 508 out of 750 had refused to be slaves any longer. The men complain of many irksome and alleged unjust regulations under which they have to perform their duties, and the slightest infraction of which renders them liable to punishment of one kind or another, including dismissal or the loss of several days' work. They say, too, that the carrying out of these regulations by subordinate officials is done in a harsh and inconsiderate manner, and that their statements rarely receive any consideration from the head officials when a report is made against them. What is known as the "spot" system is regarded as especially intolerable. A man is reported by a "spot"—an individual travelling on the cars ostensibly as an ordinary passenger, but really for the purpose of keeping observation on the employés—for some trifling infringement of the regulations, and some days afterwards, it may be, he is arraigned before a superior official, and without being confronted with his accuser, and not knowing what the charge made against him is till he gets to the head office, is punished more severely than the nature of the offence calls for, little or no heed being paid to any explanation he may have to make. It is difficult to vouch for the accuracy of these statements, but it is impossible to move about among the men without hearing these alleged

L.U.T. attitude—continued.

employés. The large majority of the staff have nobly asserted their manly independence of outside influences, and to these men the directors tender their best acknowledgments. Personally, I am more than proud that the confidence reposed in my comrades during so many years of successful work has been so magnificently vindicated.

J. Clifton Robinson,
Managing Director."

Sir Clifton Robinson, after visiting different parts of the tramway system, returned to the offices of the company in the High Road, Chiswick. There a number of men who were on duty had collected. Addressing them, he criticised the attempt to stop the cars, and he said he believed about 150 men had refused to go to work; but, he added, they forgot that there were 300 men waiting to take their places. He was glad to acknowledge the services which the men who were working were rendering to the public and the company. Those who had been true would get a bonus in the form of an extra day's pay, and the "spare" men connected with the company had a regular job much nearer in view. When this was over, if they had any suggestions to make they could make them. They would find in him a friend and a champion in all their troubles; but no man who had left the service that day would come back under his flag. The speech was well received, and punctuated by cheers.

Sir Clifton Robinson states positively that he has no knowledge of any grievances suffered by the men, and that they have never approached him on the subject. Mr. "Jack" Burns, who is chiefly responsible for the strike, has not contradicted this statement. Grievances the men may have; it is difficult, if not impossible, to frame a set of rules for the control of 1,200 men without treading on the corns of some among that number. But hitherto there has been evidence of so much friendship between employer and employed in this company that it is little short of remarkable that the men, if any serious grievances exist, have not themselves placed them before the managing director. We have inquired closely, among strikers and non-strikers, into the grievances set out in the union circular, and, if the men's stories are to be relied upon, it does appear that one or two of the minor officials at the depôts have adopted methods which might be open to criticism, but that in itself is no reason for a strike. It is the duty of aggrieved employés to make sure that their employers are aware of their grievances before taking the law in their own hands, and had the London United Tramways men done this there would have been no strike."—*Thames Valley Times.*

"It is a lamentable business, and the agitators are responsible for the suffering which must come to the families of some of those men who too hastily

Men's statement—continued.

complaints being very generally made both by drivers and conductors.

This has led to many of the men enrolling themselves in the Union, with a view of obtaining better conditions of employment, and the refusal of Sir Clifton Robinson to recognise the Union's officials, who, with a deputation of the men, sought to interview him on Saturday last, led to the determination to strike.—*Surrey Comet.*

L.U.T. attitude—continued.

believed what they were told at the midnight meetings. If Sir Clifton Robinson had been asked by his men to alter some of the conditions of service which they declare to be unreasonable, and had harshly refused, the position would have been to some extent altered, and the strikers might have gained some public sympathy."—*Thames Valley Times.*

DOES BRITISH ELECTRICAL INDUSTRY NEED THE HELP OF INDUSTRIAL BANKS?

As we state in our leader pages this week, the *Daily Telegraph* has recently contained important matter relating to the desirability of British electrical industry being aided by industrial banks organised and operating on lines more or less similar to those which have been so successfully followed in co-operation with the large electrical manufacturers of Germany. Such publication before the eye of the everyday business-man type of reader can only result in good. Although readers of the Electrical Review have been made familiar with the general subject during several years past by reason of our own articles thereon, it will be of timely interest to give a summary of the points advanced by the different writers, especially as they embody the views of English banking authorities, against whom is levelled the charge of adopting an ultra-conservative attitude.

Capt. W. H. Benett-Dampier, of 16, Victoria Street, S.W., first raised the subject in our contemporary on the appearance of the prospectus of the Victoria Falls and Transvaal Power Co., inviting the public to find £900,000 additional capital for enabling the company to order electrical plant and machinery in Germany, which prospectus was criticised by us in our issue of April 9. He wrote that the prospectus threw light upon the insidious methods adopted by Germany in withdrawing British business and British capital from this country, while it also cast a reflection upon the business acumen and want of cohesion and organisation on the part of English commercial men who allowed foreign rivals to step in and take away valuable business from under their very noses, and not only this, but to allow British capital to be used to exploit it. He believes that every effort was made by the British South Africa Co. to secure that the contract for the Victoria Falls electrical materials should be placed with a British company, and that the failure was entirely due to the lack of the necessary financial support to the contracting English firm. He urged British investors to decline absolutely to supply the wherewithal to further German industrial development at their own expense. It is nothing short of a national disaster to lose a contract of this magnitude. We must meet competitors on their own ground. "It is useless for Englishmen to go about like whipped curs, and to take no steps to assert their position in the world's markets. They must be up and doing!" The sole reason for this contract going to Germany lies in the fact that Germany has large financial institutions able and willing to support business firms in such contracts. "As an example, the Deutsche Bank, although formed primarily for operations in Eastern Europe, has a staff of experts in every line of business—electrical, engineering, shipping, railways, &c.; and whereas in the present case financial support is required in order to secure large contracts for German manufacturers, the experts of the bank are instructed to make a voluminous report on the prospects of the business, which, if satisfactory, will justify the bank in guaranteeing the necessary finance. In England we have no such institution. A national industrial bank capable of undertaking business on the same lines as the German banks for the purpose of assisting established concerns in securing business, is an absolute necessity. I have discussed the formation of such a bank with several of our leading bankers and men of business, but, although they all readily recognise the value of such an institution, none of them seems prepared to take the trouble seriously to organise such an undertaking. I have evolved an elaborate and comprehensive scheme for such a bank—one which has met with the approval of gentlemen of the highest commercial and political standing, but it requires general support to carry it into effect."

The next communication came from a German whose life had been passed in the business of banking. He said that the previous correspondent had put his finger upon the chief cause of the recent rapid commercial development and financial success of Germany. He charges English banks with being excessively conservative and not best calculated to assist English commerce under modern conditions of competition. The intimate association of the great German banks with the leading firms of contractors was responsible for many recent striking German successes in contracts. "The English banker would, no doubt, say that his bank would not care to run the risks which a close association between a bank and a contractor would appear to involve . . . . perhaps it would not be right for him to take such risks as long as English banks work upon a basis of huge deposits with a comparatively small paid-up capital. This may be a justification for existing English banks, but to anyone acquainted with German banking methods it seems that such a course must lead to England's losing much good business, and, at any rate, it fails to encourage English commercial enterprise. I quite agree with Mr. Benett-Dampier that there is great need for the establishment of financial institutions such as he has in his mind."

This writer mentions a case of a German bank having tendered in the bank's own name for a large contract, having arranged with their head office in Germany to provide the German contractor and the material. In tendering for the same work, an English firm had extreme difficulty in persuading an English bank to lend even the amount of the deposit money.

Mr. H. M. Mathes, writing from 54, Old Broad Street, E.C., on April 14th, continues the discussion, saying that the man in the street blames the present Government for the prevailing trade depression, "but there are other reasons besides that. We require fresh combinations, in the shape of banks, bankers and financial institutions to create and support national and international enterprise. Even young Japan is ahead of us with an Industrial Bank of Japan, which, though only of recent birth, has proved already a great success." He refers to the difficulty of arousing the necessary financial support for new undertakings, and mentions a piece of highly remunerative business, to carry out which English firms are particularly suited, "but the finance cannot be arranged in this country, and I am obliged to have recourse to foreign capital." The contracts and large quantities of material required naturally will follow the flag of finance. "There are about a dozen foreign banks in London devoting exclusive attention to international business, but not one English bank of any importance which is doing so." He concludes by saying that substantial new institutions assisting national and international trade and industry would find good support, not only in England, but also abroad.

Captain Benett-Dampier writes again under date April 14th, and in the course of this letter he says:—

"If England is to maintain her place in the markets of the world, she must adopt up-to-date methods of doing business. The establishment of a National Industrial Bank, working on the lines of the Deutsche Bank, the Crédit Lyonnais, and similar Continental institutions, would undoubtedly be a step in the right direction. This view is universally borne out and approved by my correspondents. One gentleman, whose name is well known throughout the country as one of our largest employers of labour, writes me in a private letter that he has already been working in this direction. Having secured the necessary financial support, it would be absolutely necessary to enlist the sympathies of the Foreign Office. Unfortunately with England, it seems to be an unwritten law that diplomatists should not interfere in business. This is in marked contrast to the instructions given by the German Foreign Office, who have competent commercial attachés on the staff of each mission, whose business it is to nose out business for their fellow-countrymen. The effect of this is seen in the concessions that have been obtained at our expense in China, Turkey, and elsewhere, where until recent years Germany had no interests whatever. . . . . The success of such an institution, run on the lines indicated, would produce an abundant and rich harvest. It remains for Englishmen to take the initiative, and to reap it."

In the issue of Friday last (April 16th) the *Daily Telegraph* publishes some remarks on the subject from the pen of its City Editor, and this is followed by a number of opinions obtained from bank managers and financial experts in the City.

The City Editor remarks that it seems imperative that the line between finance and commerce must cease to be so rigidly drawn as has been the case hitherto. When profits are cut so fine the difference between success or failure is decided by the ability to raise capital on reasonable terms. Private enterprise can no longer compete with foreign rivals backed by financial institutions possessed of enormous resources, therefore we lose concessions to the detriment of the trading community.

"The suggestion of the formation of one or more great industrial banks to work on the lines followed with such success by the German financial institutions, is certainly well worth consideration. Our existing joint stock banks, are purely banks of deposit, whose special function is to keep their assets liquid, and who, therefore, cannot afford to lock up their funds in undertakings which may require several years to bring them to maturity. But there should be no difficulty in finding five or ten millions of capital for a trading bank to foster native enterprise, provided it is under the control of business men in whom the fullest confidence can be placed. Subscribers would understand that they were embarking their money with a certain element of risk, which, however, has proved to be but slight in the case of the French and German banks, but, in return for the risk, they would have the chance of securing substantial profits.

"An instance of a similar character has occurred quite recently in the case of the Victoria Falls Power Co. The British public did not respond to the company's invitation to provide some £900,000 for the installation of a big electric plant for the mines on the Rand. The Germans willingly agreed to provide the amount, but on the express condition that the necessary plant, which involves an expenditure of nearly a million sterling, should be obtained from German manufacturers. The German group, of course, satisfied themselves that the undertaking had more than a reasonable prospect of success before offering to find the money, and it is unnecessary to say that any British trading bank would need to employ experts of the highest intelligence and capability to investigate the enterprises it was asked to finance. In Germany a comparatively small man may secure a contract which necessitates

the paying down of a substantial deposit. The banks there examine the matter, and, if they approve of it, they will at once advance the sum required, getting it back again ninety-nine times out of a hundred with good interest and a share in the contractor's profits. In this country such financing is a far less easy matter, and it is here that a really strong trading bank would fill a want. The very stake which foreign financial institutions have in new enterprises compels them to look carefully after their management, and this in itself is no small guarantee of success."

Among the banking experts interviewed, we are told that there was divided opinion as to the necessity of establishing industrial banks in this country, but "there was practical agreement that without much difficulty our banking system could be *partially* adapted to meet such a need *if it became imperative*." (Our italics.)

A Far Eastern banker says that to create such banks would be a backward step:—"Continental banks of this character were adapted to the organisation of their respective countries, but would scarcely meet our requirements so well as our own existing banks. There had been no considerable demand here for such organisations, and there was no difficulty in the way of a man launched on an industrial enterprise abroad obtaining financial assistance to any extent, provided he gave proper security and assurance that he was not involving himself in a wild-cat scheme."

Another manager asserted that there are several banks in London "which already engage to some extent in financing industries, but they have a considerable foreign element in their management. The lead which Germany has taken in the matter he attributed largely to far-sightedness and alertness. Rendered lethargic by the consciousness of our wealth, we had 'gone to sleep.'" "Yet," he added, "we have got the machinery for doing precisely what the Germans have done. With a little energy we could so reform our banking system that our enterprising countrymen involved in industrial enterprise abroad could be put on more even terms with their foreign rivals, whose efforts are given a fillip by their own financial houses, and who receive Governmental encouragement. What is needed is more energy and wakefulness. But the financing of industries could not be undertaken by all banks in all circumstances. The ordinary deposit banks are quite unadapted to such purposes. Content to receive his modest interest, the average depositor would naturally shrink from becoming, as in effect he would, a promoter in an enterprise of which he was incapable of personally judging the merits. Consequently, industrial banks would have to be mainly established for the special purpose of financing industries depending for their security upon the fullest investigation into such enterprises as they aided. In Japan the demand for such banks arose, and the supply grew as a matter of course."

The locking up of capital in such a manner was regarded unfavourably by one gentleman interviewed, and on this same point an expert "of great experience" admitted that there might be difficulty in this country in raising money to be specially employed in financing industry. Banks must keep their assets in liquid form, ready to quickly realise, but money lent to encourage industry abroad was not easily realisable. In his view, the financing of industries was more the business of trust companies—but "trust companies seemed to fight shy of this kind of business." "Even if banks did take up the line they would be saddled with an unfortunate name, and people would not deposit if there were doubt of their getting their money back easily. The German banks were only deposit banks in a very limited degree; they had a much larger paid up capital than English banks. He advocated the formation of a big promoting bank or trust company, and arguing particularly regarding the recent Victoria Falls instance, expressed an emphatic opinion that there ought to be a closer alliance between finance and industry in England.

"We did not hustle, therefore we missed much. . . . The German Government helped its people. . . . Our Government did nothing of the kind. That was where our weakness lay."

The only other expression of opinion that we will refer to is, in certain respects, one of greater interest than the foregoing, because it emanates from an official of a large contracting electrical firm which has had a wide experience in the execution of foreign concession contracts—Mr. Burton, of Messrs. J. G. White & Co., Ltd., of Cloak Lane, E.C. This gentleman was not prepared to regard the establishment of industrial banks as an unmixed blessing.

"Of course, money must be found to finance commercial enterprises, but whether the right way to do it is through industrial banks—that is, to follow exactly the German method—is a question on which people will hold different views. The strength of the British position in international enterprise is essentially the financial strength of this country. It was pointed out recently in a speech by a well-known London financier that the exports of British material are very largely due to the fact that so many foreign undertakings are financed here. In our business we buy some things abroad, but the vast bulk of the supplies for foreign work are obtained in this country, partly because they can be bought to better advantage. But the real reason why they are bought here, the reason why things are concentrated here, is because this is the money centre, and undertakings receive their financial backing in this country. The importance of our being able to finance foreign enterprises, particularly by British firms, is therefore great, but whether we should do it on rigid lines through the medium of industrial banks is another question."

"Assuming a scheme is sound, and it can be shown that the earnings will be good, it can be financed on sufficiently favourable terms. Probably our method takes longer than the German method, because undoubtedly the German system is better organised. You would probably need to go to more people here than in Germany, and it would be necessary to get a group together to promote the enterprise. The fact cannot be gainsaid, however, that this country is the financial centre, and there is more British money in foreign enterprises than any other country's money. The class of business I am referring to is not a banking proposition in this country, but it is one that individual investment trusts interest themselves in very largely. Generally speaking, it was easier to raise money for commercial enterprises in this country than elsewhere. 'If you adopt the German system,' he continued, 'you almost inevitably adopt the trust system. Supposing you had an industrial bank, you would find in course of time that it would be working with one specific group of manufacturers and contractors. The men outside that group would be so handicapped that the almost inevitable result would be a tendency to consolidation—to the adoption of the plan of concentration which exists in Germany and America. That system undoubtedly offers advantages in economy of production and in some other ways, but, on the other hand, it has very decided social disadvantages. I might like to see a bank of that kind established if I was sure I was going to be in the banking group, but naturally I should not wish to see it organised solely for the benefit of my commercial competitors. On the whole, I think it might be better for the average man not to have these matters centralised, as in Germany."

BUSINESS NOTES.

Bankruptcy Proceedings.—*Re* C. H. W. Biggs.—Under the failure of this debtor, printer and publisher, also owner of the *Electrical Engineer*, carrying on business at 139 140, Salisbury Court, Fleet Street, E.C., under the style of Biggs & Sons, and residing at Glebe Lodge, The Glebe, Champion Hill, the first meeting of creditors was held on Thursday, April 8th, at the London Bankruptcy Court. Mr. E. Leadam Hough, Senior Official Receiver, reported that draft accounts had been lodged, showing assets valued at £3,562, and consisting of cash, £5; stock-in-trade, £100; machinery, plant, fixtures and fittings, £1,500; furniture, £300; *Contract Journal* shares, £522 10s.; Eastern Extension shares, £10; and book debts, £1,125. There was also money in the bank, but the account was in the names of the debtor's sons, and the balance was claimed by them. There were heavy preferential payments to make for rent, rates, taxes, wages, and Sheriffs' charges, in all amounting to £564, which would reduce the assets to about £3,000, and as the unsecured liabilities were returned roughly at £8,600, the deficiency could be taken at £5,600. Then there were creditors for £750, who held shares and life policies valued at the full amount of the claims. When before the examiner, the defendant had stated that he commenced business as a printer 25 years ago in partnership with a Mr. Parker. They each provided £500 as capital, and took premises at Mac's Place, Fetter Lane, where they traded as Charles & Co. Two or three years later they removed to Gough Square, and there remained for two years, when Mr. Parker died. The business was then taken to Salisbury Court, and soon afterwards the debtor was joined in partnership by Mr. Eric Debenham, who provided £2 000 as capital, the trading style being altered to Biggs & Debenham. Mr. Debenham left the firm one year afterwards without any notice, and subsequently the debtor continued the business alone as before, but two years ago he altered the style to Biggs & Sons. It appeared that the sons were employed in the business, but some of the creditors had regarded them as partners, and the circumstances would in due course be fully investigated. The partnership with Mr. Debenham was a material point for consideration in consequence of a claim for some £5,000 having been put forward by the trustees of the estate of Mr. Debenham's late father, who was stated to have provided the £2,000 put into the business when the partnership of Biggs & Debenham was entered into. He had asked how that claim had been kept alive, and it appeared that acknowledgments had been given from time to time, and that the £5,000 represented the original £2,000 plus accrued interest. It further appeared that the debtor was the printer, publisher and owner of the *Electrical Engineer*, and was also the printer and publisher of Biggs & Sons' *Contract Record*, a weekly newspaper started last September, with the result that another newspaper which had been previously printed by the debtor, launched proceedings against him for an injunction. The plaintiffs, in those proceedings, were the *Contract Journal* Co., and he (chairman) understood that in addition to the action for an injunction, an action for accounts, &c., had been entered. The debtor disputed both actions. Further, he was the chairman of directors of the Roundhill Mining Co., and held £300 shares, which he had charged to creditors. Under the will of Mr. John Crook, the debtor was entitled to £400, but that he had charged to his solicitors to secure advances, and the costs of the actions launched against him by the *Contract Journal* Co. His wife had a little separate estate, she held shares in the *Contract Journal* Co., and £30 of the furniture was claimed by her. There was no proposal before the meeting; the debtor had been adjudicated bankrupt, and he attributed his failure to the claim put forward by the Debenham Trustees. It being the desire of the creditors that the business should be continued in order that its value as a going concern should not be lost, he (Official Receiver) had appointed Mr. G. M. White as special manager, at a remuneration of £5 5s. per week, to carry on the business until the trustee had been certified by the Board of Trade. Resolutions were passed for Mr. A. R. King-Farlowe, C.A., Gresham Street, E.C., and Mr. G. M. White,

C.A., 14, Old Jewry Chambers, E.C., to act as joint trustees and administer the estate in bankruptcy, assisted by the following committee of inspection, viz., Mr. Joseph Dewick (Herring, Dewick and Co.), Mr. H. A. Lussey, and Mr. Haslock, managing director of Messrs. Shackell & Co. The bond to be given by the joint trustees was fixed at £3,500. The public examination of the debtor will be held on May 12th.

United States Exports.—The *Electrical World*, New York, says: "During February the exports of electrical instruments, &c., were valued at $462,856, as compared with $479,779 in 1908; while for the eight months the total was only $3,768,831, as compared with $4,837,402 in 1908, and $5,714,192 in 1907. There is quite a sharp drop here, but it occurs very largely in shipments to the United Kingdom, whose trade depression has been so prolonged, like our own. In 1907 England took electrical instruments and appliances to the extent of $1,237,363 in the eight months, while in the recent corresponding period the amount was only $400,469. Turning to heavy electrical machinery, another marked decline is seen. The exports this February were only $508,736, as compared with $844,047 a year ago. Here the falling off in orders is due to Mexico during the eight months, with a sharp drop for the month. During the eight months 1908-9, the grand total was $4,233,597, but last year it was $6,109,412. In like manner, the demand from Mexico dropped from $1,000,977 to only $430,072, and Japan gave equal evidence of lessened consumptive capacity by taking only $641,920 instead of $1,040,917."

The Building Trade.—A correspondent who called at Trafford Park, Manchester, the other day, was informed that negotiations are now proceeding with several leading firms with a view to their acquiring sites in Trafford Park and erecting works thereon, but as no definite arrangements have as yet been made, their identity at the present juncture cannot be disclosed. Building trade prospects in Lancashire are now improving, plans for many hundreds of houses having lately been passed by local authorities in central and south-east Lancs.

Private Meetings.—J. Defries & Sons, Ltd., 147, Houndsditch, London, E.C., dealers in electrical appliances, &c.—A largely attended meeting of the creditors interested in this matter was held on Wednesday, April 14th, on the premises of the company, 147, Houndsditch, E.C. The company had already gone into voluntary liquidation, Mr. A. F. Whinney, 32, Old Jewry, E.C., being appointed as liquidator. The chair was occupied by a brother of Mr. A. F. Whinney, who explained that the liquidator had been called away to Ireland on business. He added that the meeting was a formal one, called in pursuance of Secs. 26 and 27 of the Companies' Act, 1907. He was unable to give much information as to the position of the company, but the whole of the property was in the hands of Mr. Whinney, who was appointed receiver and manager by the Court on March 19th last. He was carrying on the business with a view to realising the assets to the best possible advantage, which would doubtless be by disposing of the business as a going concern. Upon that realisation depended what the creditors would receive. It had been difficult to get at what was the real position of the company.

A creditor asked what the position of the company was, and said that they would be satisfied with a rough statement of the liabilities and assets. Mr. Whinney replied that there were debentures for £15,000, while the creditors of the company amounted to about £120,000. With regard to the assets, they included book debts amounting to £19,600, but it looked as if quite £10,000 were doubtful, and they would thus realise about £9,600. The plant, machinery and stock were valued at £30,800. This was the value placed upon them by the managers of the various departments, and represented cost, less depreciation. He did not know at what figure those assets stood in the books of the company. A balance-sheet had not been prepared for some time past. There were other assets of the company, including properties in Devon and Cornwall.

A suggestion was made that a committee should be appointed to formulate some scheme for the benefit of the creditors. A committee could consider the matter, and recommend the other creditors what was the best course to pursue. Mr. Houston said that the chairman had informed him that he would agree to an adjournment for a month, when a full statement would be placed before creditors. The order of the Court ran till June and by adjourning, their rights would not be prejudiced. With a full statement before them they could better make up their minds as to the best course to pursue.

Mr. Defries then addressed the meeting, and was understood to say that when the stock was last taken it amounted to £40,000, without plant and machinery, and considerable additions had since been made. With regard to the book debts, it was expected that some £10,000 would be bad. The amounts in question were not really book debts, but represented sums which the company had advanced to businesses in which they were interested. The present state of the books was due to the fact that the secretary of the company had been ill, and consequently the books fell into arrear. For some considerable time past the company had been engaged, not so much in making profit, but in perfecting the mechanism for making profit. Certain matters fell through at a time when the mechanism for making profits was almost completed, and schemes prepared. As a going concern the company was worth many times the amount of the material assets which had been given to them that day. He would be prepared to devote himself to any scheme which promised payment of the debts in full, together with interest. He did not see how it was possible for the creditors to be paid in full if the assets were taken in pieces and sold, but the whole of the business as a going concern was more than sufficient to pay the debts twice over. Whether anything could be done depended to a very large extent upon the attitude adopted by the creditors. The debentures were issued in the early nineties, and were returned every year in the form required by Somerset House. When the debts of the company were incurred they had no idea that the present position would arise.

It was suggested that as the business was a very complex one the services of Mr. Defries should be retained, and the chairman replied that Mr. Defries was assisting the manager and receiver in the carrying on of the business. After some further discussion it was decided that the meeting should be adjourned for a month in order that further information should be given to the creditors.

Trade Announcements.—The business of the late firm of Messrs. Scholes & Co., of 4, Corporation Street, Manchester, has been taken over by the Electrical Industries Supply Co., of 2, Macdonald's Lane, Corporation Street, Manchester.

The Malleable Steel Castings Co. (1909), Ltd., have removed to larger premises, and their address is Scotia Works, Lonsdale Street, Pendleton, Manchester.

Messrs. Cresswell's Asbestos Co., Ltd., of Wellington Mills, Bradford, have recently installed special machinery for the production of asbestos stripping or paper tape, which is being sold at much lower prices than hitherto have been possible for hand-cut stripping. We have received a sample, the cutting of which is very clean and free from jagged edges, whilst the winding is evenly and tightly done, making the rolls easy and safe to handle. The firm can cut any width of stripping down to ½ in., and rewind in rolls up to 6 in. diameter or more. They also make asbestos fibre, yarns, cords, &c., as well as rolled paper tubes and other special lines for electrical consumers.

Messrs. Balchin, Schulz & Co., Ltd., have opened a branch of their business at Prudential Buildings, 97, Above Bar, Southampton, for dealing with the installation of electric light and power in country and town houses, factories, ships, yachts, &c. They desire to receive price lists from electrical and machinery manufacturers.

The Electrical Co., Ltd. (A.E.G.), state that the number of orders received for their new high efficiency lamp has far exceeded their calculations, and their stock has been completely exhausted. The works, however, are manufacturing with all possible speed, and it is hoped to have all orders now in hand executed within a fortnight.

Accumulator Cars for Railways.—The Prussian State Railway authorities some time ago, as was mentioned in this journal, placed orders with three firms for the delivery of a total of 60 storage battery cars for use on local and light railways. Many of the coaches have already been supplied and placed in service in different parts of the kingdom, and the Felten & Guilleaume Lahmeyer Works Co., which is one of the three firms concerned, has now received an order for the provision of 10 further accumulator cars, which are to have a speed of 31 miles an hour, and are to be used in the railway district of Frankfort-on-the Main and Mayence.

Quix.—We have received a sample tin of Quix. This is a liquid cleanser, which contains no gritty substance, and no caustic, but cleanses the skin by dissolving the grease and taking the dirt with it. It is specially intended for motorists, engineers, &c., and from our experience of the sample appears to carry out what is claimed for it. The makers are the White Band Manufacturing Co., Ltd., Progress Works, South Croydon.

Book Notices.—*Röntgen Ray Wrinkles.* By Leslie Miller. From the author. Price 1s.—In this little book the author, whose experience in connection with X-ray apparatus needs no emphasis from us, comes to the aid of the inexpert radiographer, providing answers to the numerous questions which the operator's difficulties, sooner or later, are sure to suggest. There is, of course, no attempt to deal with strictly medical matters. The author's explanations are illuminating and at times picturesque; his instructions deal with every phase of X-ray work, including the exposure and development of negatives, and the various types of X-ray tubes are described, with numerous hints on their handling and use for different purposes. In fact, his book acts well up to its title, and is sure of a welcome from those who are not already skilled radiographers.

English Prices with German Equivalents. By St. Koczorowski. London: E. & F. N. Spon. Price 1s. net.—This little table-book gives the equivalent prices for seven rates of exchange, the rates in pence per lb. advancing by sixteenths from 1/16d. to 1s., afterwards by farthings to 5s., and so on. Equivalents per ton are tabulated, and the German equivalents in marks per kg. are given to four decimal places.

English-Russian and Russian-English Engineering Dictionary. By Leo Meycliar. London: E. & F. N. Spon. Price 2s. 6d. net.—Russian is a sealed book to all but a select few in this country; yet there is in Russia an immense field for the British engineering trades to cultivate, and we are glad to welcome a book such as this, which will do much towards breaking down the barrier of Babel that exists between the two nations. In addition to the glossary, an appendix gives illustrated regulations relating to freeboard marking for steamers, thermometric tables, and English equivalents of Russian weights and measures.

A.E.G.-Zeitung.—The Allgemeine Elektricitäts Ges., of Berlin, which for many years has circulated a magazine amongst its employés, has now decided to publish it to a wider circle of readers, and we have received a copy for April. It is a handsome production, fully illustrated, and contains articles on the A.E.G.-Kreuzer-Turbine,

used, as its name implies, in the German Navy; the Cöln-Dusseldorf electric railway; the Victoria Falls and Transvaal Power Co., to which the A.E.G. is supplying and has supplied a large quantity of plant; Electricity in Agriculture; the Oberspree-Victoria-Pneumatik, and many minor matters. The issue is attractive and interesting.

Herzogs Elektrotechnisches Jahrbuch. Edited by Ing. Siegfried Herzog. 1909. Stuttgart: Union Deutsche Verlagsgesellschaft. Price M. 12.—This is the first issue of what will doubtless become a familiar annual, intended to be a reference book for engineers, draughtsmen and advanced students. The contents, drawn from a variety of sources, consist of information and data bearing upon the design, construction and working of all kinds of electrical apparatus and plant, electric railways, lighting, heating, power, transmission lines, electro-chemistry and electro-metallurgy, telegraphy and telephony, &c. The main subjects are arranged in alphabetical order, and the paragraphs under each main heading are similarly ordered, so that reference is easy; there is also an alphabetical index to headings and sub-headings, and a complete general index to the contents. In each case the source of the information is given, and there are numerous cross-references. The items in most cases are of the nature of brief abstracts, necessitating reference to the original source for more detailed particulars; but many complete tables of data are included. As a handy guide to the literature of electrical engineering in German, English and French, the year-book should prove exceedingly useful; its compilation must have entailed an enormous amount of labour.

Kerrawalla's Textile and Engineering Directory and Year Book for 1909. Parel, Bombay: C. D. Kerrawalla; and Preston: W. Vernon.—This is the fourth issue of the directory, which contains a variety of useful information regarding cotton and jute machinery and other matters of interest to engineers. A lengthy list of Indian mills, mines, and factories, as well as a list of cotton mills in Japan, is given, and a diary forms part of the volume.

"Fortschritte der Elektrotechnik." 1908. Edited by Dr. K. Strecker. Vol. 2. Berlin: J. Springer.

"Science Abstracts." Vol. 12, Part 3; March 25th, 1909. Sections A and B. London: E. & F. N. Spon. Price 1s. 6d. each section.

"Canadian Society of Civil Engineers: Charter, By-laws and List of Members, 1909." Montreal: The Society.

"Model Aeroplanes: How to Build and Fly Them." London: Percival Marshall & Co. Price 1s. net.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXVIII, No. 4. April, 1909. New York: The Institute. Price $1.

"*Journal* of the Western Society of Engineers." Vol. XIV, No. 1. February, 1909. Chicago: The Society. Price 50 cents.

"*Journal* of the American Society of Mechanical Engineers." Vol. 31, No. 4. April, 1909. New York: The Society.

"*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXV; part 5. April, 1909. London and Newcastle-upon-Tyne: Andrew Reid & Co.

"The I.C.S. Student." Vol. I, No. 2. April, 1909. London: International Correspondence Schools, Ltd. Price 2d.

"A Comedy of Ambition." By A. Gowans Whyte. London: A. Melrose. 1909. Price 6s. net.

"La Machine à Influence." By V. Schaffers. Paris: Gauthier-Villars. 1909.

"*Proceedings* of the Physical Society of London." Vol. XXI, part III. March, 1909. London: Taylor & Francis.

Hot-Strip Arc Lamp.—The Foster Arc Lamp and Engineering Co., Ltd., Wimbledon, who claim that their "Thermo-Lamp" is the simplest arc lamp made, have introduced improvements in their new pattern, which is reserved for use with alternating current only. They are now able to enclose the mechanism completely, without in any way affecting the sensitive action of the thermal control, and by this means, coupled with increased proportions, the life of the thermal strip is greatly prolonged. Most of the parts have been strengthened, the whole of the case and external parts are completely insulated from all live parts, and the consumption has been reduced to 400 watts for 1,000 H.C.P. Some 40 of the first 100 hot-wire lamps the company ever made are still running at Wimbledon Park, and, beyond globes, we understand that they have cost the authorities nothing whatever for renewals.

Catalogues and Lists.—Sun Electrical Co., Ltd., Charing Cross Road, W.C.—Leaflet announcing reduced prices of "Kalkos" tubes, and illustrating a selection of new "Kalkos" fitments.

Messrs. Haslam & Schontheil, Western Mail Chambers, Cardiff.—New price list of the Alpha patent cable connectors, which, we understand, are being largely used by central station engineers, cable companies, collieries and power distribution companies. The range of sizes and types has been considerably added to.

Messrs. Ludw. Loewe & Co., Ltd., Farringdon Road, E.C.—Leaflets relating to the "Flexilis" steel castings, a recent introduction, for which they have just been appointed agents. We understand that at their showrooms at the above address, the firm have a variety of remarkable castings made by this secret process, and they will submit test-pieces to firms wishing to make their own tests.

Messrs. D. H. Bonnella & Son, Ltd., 58 and 60, Mortimer Street, W.—Catalogue (Section M) giving particulars and prices of a variety of roof lights, battery lamps, batteries, switches, carriage fittings and other motor-car accessories.

Messrs. White Bros. Engineering and Machinery Co., Ltd., High Street, Stratford, E.—New catalogue of second-hand plant and machinery, including electrical, for sale or hire, &c.

Mr. H. B. Brooks, Granville Works, Tennant Street, Birmingham.—Price list (L 21) of electric ventilating fans of the box-blade type, for direct current.

Messrs. Marples, Leach & Co, Ltd., Artillery Lane, E.C.—Pamphlet (T 4) illustrating and describing a new electric hooter fire alarm system, which they have just placed on the market.

The British Electric Calibrated Fuse Co., Harpenden, Herts.—Well illustrated pamphlet describing their new fuse switches.

Messrs. E. Bennis & Co., Ltd., 28, Victoria Street, S.W.—24-page pamphlet fully illustrated with half-tones and line blocks, describing their stoker and coal-handling plant, supplied in connection with the Coventry Corporation electricity works.

Messrs. Siemens Bros. & Co., Ltd., Caxton House, Westminster, S.W.—Publication No. 31 B describing the Neotherm cell, which is claimed as a novelty in connection with primary cells, the depolariser being reoxidised by heating the containing vessel. Batteries made up of Neotherm cells are said to form an excellent substitute for accumulators, over which several important advantages are claimed.

British Insulated and Helsby Cables Co., Ltd., Prescot.—Twenty-four-page illustrated catalogue (supplement No. 1 P. 88) showing, and tabulating prices of, a variety of the company's Prescot overhead materials for electric tramways.

Liquidations.—Electromobile Hiring Co., Ltd.—A meeting is to be held at 7, Hertford Street, Mayfair, W., on May 18th, to hear an account of the winding-up from the liquidator, Mr. George Cockerton.

Monobloc Accumulator Syndicate, Ltd.—A meeting is to be held at the offices of Drake & Gorham, Ltd., 66, Victoria Street, S.W., on May 26th, to receive an account of the winding-up from Mr. H. Newson-Smith.

The Okonite Co., Ltd.—This company is winding up voluntarily, with Mr. W. T. Ogden, 56, Moorgate Street, E.C., as liquidator. A meeting of creditors is to be held on May 3rd.

LIGHTING and POWER NOTES.

Australia.—The electric lighting of Hawthorn (Victoria) is being considered by the local authorities; the cost is estimated at about £95,000, and as an alternative, a suggestion is made to obtain a supply from the Melbourne Electric Supply Co.

The output of the Melbourne Municipal Electrical Works increased from 3½ million units in 1902 to 7½ millions in 1908.

Barking.—According to the annual statement of the chairman of the Council, the electric lighting undertaking during the year made steady progress, as shown by the fact that 1,583,713 units were generated, and 1,337,344 sold, an increase on the former head of 326,104, and under the latter of 269,906, or 25 per cent. The number of units used for traction was 328,910, an increase of 20,063. He anticipated that the department would this year prove self-supporting. This result has been arrived at by the increased sale of energy for power purposes, chiefly at Creeksmouth, and by the fact that the cost of the coal was only slightly heavier than that of the previous 12 months, despite increased output.

Birkenhead.—The estimates of receipts and expenditure of the Corporation for the forthcoming financial year show that on the income side the electricity department contributes £1,000 and the Tramway Committee shows a balance upon its estimates of income beyond expenditure of £585. The capital outlay for the year includes £2,881 for tramway extensions and adaptations.

Carnoustie.—The T.C. has not yet been able to come to an agreement with the Gas Co., whose undertaking it desires to take over. Meanwhile feeling is growing stronger in favour of a scheme for electric lighting, and it is believed that if a company took the matter up the enterprise would prove a success.

Continental Notes.—Belgium.—What is claimed will be the most powerful electric winding engine in Belgium is about to be installed at the No. 1 pit of the collieries of the Société des Charbonnages de Mariemont, at Mariemont, by the Société des Ateliers de Constructions Electriques, of Charleroi. It will be equipped with a motor of 1,200-1,800 H.P. (500 volts), and will be capable of raising an eight-truck cage, weighing 12½ tons, from a depth of 840 yards at a speed of about 36 ft. per second.

Dunster.—Somerset C.C. has granted a licence to the Minehead Electric Supply Co. to erect overhead mains for the supply of electricity to Dunster.

Fleetwood.—The Electricity Committee of the local D.C. has had a special report from Mr. O. Hanson with reference to the application of the railway company for a further supply of energy for lighting and power. The chairman of the Committee and the clerk were authorised to interview Mr. Charles Furness, of Blackpool, in order to obtain further information and advice in reference to the matter.

Glasgow.—The T.C.'s Committee on Parliamentary Bills has instructed a sub-Committee to endeavour to have clauses inserted in the Electric Lighting Acts (Amendment) Bill, (*a*) saving the local Acts of the Corporation, and (*b*) providing that "Where in any area a local authority, company or person is authorised to supply electricity under Act of Parliament, or under licence or provisional order granted under the Electric Lighting Acts, it shall not, after the passing of this Act, be lawful, without the consent of such local authority, company or person for any other local authority, company or person to supply, distribute or transmit electricity within the same area, unless such supply, distribution or transmission is authorised by Act of Parliament or by licence or provisional order, granted in terms of the Electric Lighting Acts."

Gravesend.—Arc lamps of a more modern type are to be used for public lighting, by which the lighting bill will be reduced from £890 to £720 per annum. The cost of the alterations will be £590.

Greenock.—In connection with the loan of £25,000 granted last week to the T.C. by the Secretary for Scotland in connection with the electricity department extensions, the Examiners of the accounts have reported favourably on the extensions and on the conduct of the undertaking.

Halsworthy.—The U.D.C. has received a copy of the provisional order which it is proposed to issue to the Halsworthy Electric Lighting Co., from the B. of T., which asked if the Council had any further observations to make in the matter. The clerk said the order had been slightly altered from the agreement come to between the Council and the company. As the order read at present it would be necessary for the Council to give notice on one particular day if it wished to purchase, or it would lose the right. The original wording gave the Council the option of purchase at any time after the expiration of 25 years. It was decided to adhere to the wording of the original draft.

Hastings.—Considerable comment has been made in Hastings consequent upon an American Syndicate having decided to illuminate St. Leonards by gas instead of electric light, as originally intended. The syndicate desired to put at least 4,000 electric lights on the Pier, but the terms offered by the Corporation were declined. At this week's meeting of the Corporation, questions were asked, and on behalf of the Electricity Committee, Alderman Tree said the syndicate offered to pay only 2½d. per unit, whilst the Corporation has decided to charge its large consumers 6½d. per unit. The engineer had also informed the Committee that, in order to supply 4,000 lights to St. Leonards Pier, it would be necessary to put down a special cable from a sub-station at a cost of £1,000. He believed that the gas company and large consumers of electricity, would have been within their right if they had sought an injunction against the Corporation if it had accepted the offer of the syndicate.

Heston and Isleworth.—The U.D.C. Electric Lighting Committee has been considering the need of extending the battery, which at present consists of 272 cells, in view of extensions of the supply system. A letter was read from the L.G.B. assenting to loans amounting to £5,545, to defray expenditure already incurred on mains, house services and meters in 1907 and 1908, conditional upon the Council undertaking in three years to defray a deficit of £3,000 upon the free wiring and preliminary expenses account.

London.—Bermondsey.—The Electricity Committee of the B.C. has had before it a memorial, presented by a deputation of ratepayers, recommending the Council to continue its present system of destroying refuse in conjunction with the electricity undertaking. The Committee has informed the memorialists that it is not proposed to interfere with the present arrangement.

The tons of refuse disposed of through the destructor during the year ended March 31st, 1908, were 25,507, the net cost being £5,296, equivalent to 4s. 1·83d. per ton destroyed, of which 1s. 7·02d. represented loan charges. The report was considered at a special meeting of the Council, held last Thursday evening. A long discussion ensued as to whether the report should be taken back by the Committee for further consideration, but in the end this was defeated by 15 votes to 10, and the report was adopted.

Mexico.—A Canadian syndicate, headed by Dr. Pearson, has secured from the Mexican Government a concession for the construction of two dams on the Conchau River, which will be used for irrigation and generating electrical energy for supplying Santa Rosalia, Perral and neighbouring towns. The work is to be completed in three years.

Mountain Ash.—The U.D.C. has arranged with the South Wales Electrical Power Distribution Co. to purchase electricity from it in bulk, and hopes to be able to supply consumers before the end of the summer.

Penge.—A public meeting has been held to consider a report by a committee dealing with a scheme for improved street lighting. The report states that although the scheme submitted by the South Metropolitan Electric Light and Power Co. compared favourably in some respects with gas lighting, considerations of capital expense led the committee to favour inverted gas lighting. The report is to be forwarded to the local Council.

Scottish Electricity Supply.—The Standing Joint Committee of the County Councils Association, of which Lord Camperdown is President, has passed a resolution in favour of a representation being made to the B. of T. with a view to getting a short Act of Parliament passed, prohibiting any company or person, unless authorised by the B. of T. under the Electric Lighting Acts, or by Parliament, from distributing or supplying electrical energy for sale within the area of supply of any authorised undertaker.

Sunderland.—At a meeting of the T.C. on the 14th inst., the Electricity and Lighting Committee recommended that an agreement with a local firm of millers be sealed for a supply of electricity for power purposes.—Alderman Bruce moved the adoption of the report, and mentioned that the Committee found themselves with a considerable amount of Corporation machinery in Laing's Shipbuilding Yard (now in liquidation, and closed) and in a building for which the Corporation had to pay rent, and for which they could not get any return. In future they would not put down any plant on other person's property and pay rent. The manufacturer would have to bear the loss in transmission.—Mr. G. S. Lawson said that was the thin end of a wedge that would involve an expenditure of over £21,000 for extensions. He said that £6,000 had been invested by the Corporation in Messrs. Laing's shipyard. Their dividend had dropped from 9½ per cent. to 5·91 per cent. since they took large consumers. It was now proposed to supply this firm at a cost which would work out at just half what was charged to the shipyards, some of which paid ¾d. per unit, and the average was over 1d. per unit.—Mr. G. New said it was proposed to spend £340 in order to gain valuable experience of supplying electricity in bulk. Had trade continued in the state it had been when the shipyard agreements were made, there would have been a considerable profit from them.—The agreement was formally approved.

U.S.A.—Dispatches from Seattle, Washington, mention that, with a capitalisation of $8,000,000, the Puget Sound Power Co. has been incorporated as a holding company to take over all the electric light, power and street railway systems in the north-western part of Washington. Besides holding existing plants and properties, it is the intention to continue inter-urban and power extensions that will culminate in a continuous line of inter-urban rails from Vancouver in British Columbia, to Portland in Oregon, with a service to the Grays Harbour towns. The big properties which are to be transferred to the holding company include the Seattle Electric Co., the Seattle Tacoma Power Co., the Puget Sound Electric Railway, the Tacoma Light and Power Co., the Everett Interurban, the Everett and Bellingham Street Railways and Light and Power Corporations and others.

It was reported about a week ago that the lower Niagara River, for some 20 miles to the falls, was choked up with ice, necessitating, owing to their flooding, the closing of all factories and power plants.

Wolverhampton.—The Corporation electric mains are to be extended a distance of about 800 yd., at an estimated cost (including switchboard and transformers) of £700, in order to supply the new lock and safe works of Messrs. Chubb & Sons, Ltd.

TRAMWAY and RAILWAY NOTES.

Barking.—The number of passengers carried by the tramways during the past 12 months was 1,280,420, as compared with 946,890 in the previous 12 months. The receipts amounted to £3,130, as against £2,660. Notwithstanding the increase, the financial result of the working is far from satisfactory. The negotiations with the Ilford Council for inter-running have been dropped; but the agreement with East Ham has still 18 months to run.

Brazil.—The activity of the Rio de Janeiro Tramway, Light and Power Co. is in no way being relaxed, and electric tramways are now being laid along the Rua Uruguayana, one of the most important thoroughfares in Rio. The completion of this new line will make one more loop which should be of the utmost convenience both to the public and the company. In addition to this line, others are being laid in all directions in outlying parts of Rio de Janeiro.

Canada.—For the year to June 30th, 1908, the electric railways in the Dominion carried some 299 million passengers and 733,000 tons of freight; the car-mileage totalled 57 million, 553,000 of which represented freight car-mileage. In addition 300,000 miles were run by locomotives. The lines worked amounted to 992 miles, and the paid-up capital was 88 million dollars.

The third annual report of the Ontario Railway and Municipal Board shows that 33 million dollars are invested in electric railways in that province, and that some 22½ million car-miles were run.

Cardiff.—The T.C. on Friday, by the casting vote of the Lord Mayor, decided not to appoint an expert to advise the Council as to the best way of economising in the working and administration of the electric tramway system, in order to prevent the same becoming a charge on the rates.

Continental Notes.—Austria.—A public service of electric motor-cars on the Mercedes-Electrique-Stoll system is being established between Leising and Kalksburg, near Vienna, a distance of about 4 km. The vehicles will take their energy from overhead conductors, the same as electric tramways.

Russia.—Negotiations are in hand for the conversion of the horse tramways in the town of Kharkoff to electric traction.

Devonport.—The dispute between the Devonport and District Tramways Co. and the Corporation, has reached an acute stage. With regard to the withdrawal of the cars from the leased lines, the Tramways Committee of the B.C. has decided to instruct the town clerk to issue summonses against the company for the recovery of penalties for the discontinuance of the service on the leased lines. The summonses will be returnable on Friday, 23rd inst., and will come before the borough justices.

Dundee.—The proposal to experiment with the trackless trolley system at a cost of £5,000 along the Esplanade, has been rejected by the Tramway Committee.

Glasgow.—The Bushy and District Ratepayers' Committee has decided to approach the T.C. with a view to the extension of the Corporation's tramway system to Bushy *vid* Clarkston—a distance of about 2½ miles from the present terminus at Cathcart.

Hastings.—As the result of an appeal to the Corporation, a revision of tram fares has been agreed to. The company stated that, as the result of three years' running, the returns have proved quite inadequate and unremunerative, and they have not only been unable to pay the preference dividend in full, but no provision has been made for depreciation and renewals.

Heston and Isleworth.—The U.D.C. has received notification from the London United Tramways Co. that it intends to abandon that portion of its Bill before Parliament asking for an extension of time to construct the line from Hounslow to Staines.

Liverpool.—At a meeting of the Tramways Committee on the 16th inst. it was reported that the sub-Committee, with only one dissentient, recommended the construction of a new double line in Netherfield Road (a portion of which would have to be widened) to join up with Shaw Street and Walton Road. Both the city engineer and the general manager had reported in favour of the scheme in preference to a less costly one. In reply to Mr. Thomas Kelly, the Chairman said the cost of the scheme would be £11,000. The recommendation of the sub-Committee was approved.

London.—The Metropolitan District Railway is opening a new section of line to Hounslow Barracks and a station at Hounslow in the beginning of May, and a 10-minutes' service of trains will be run on this section. Four years ago with the steam service there was only one train hourly.

Shoreditch.—The North London Railway Co. has, in consequence of the competition of electric trams and motor-omnibuses, served notice upon the B.C. requiring the reduction of the present assessment of the railway, which is £21,700 gross and £15,500 rateable, to £17,256 gross and £11,056 rateable. The Council, while it is to resist the application, has decided to seek to raise the assessment of the tramways in the borough, which is now £7,400 gross and £3,000 rateable, to £14,400 gross and £10,200 rateable.

Hackney.—The arbitrator has given his award with regard to the materials to be used for the paving between the tramrails and in the clear way in Mare Street, Clapton Road and Clapton Common. The B.C.'s requirements have been sustained as regards 4,190 lineal yards, and the L.C.C.'s objections maintained as to 281 lineal yards. The B.C. claims that the result represents a saving to it of £400 per annum. The cost to the borough of opposing the London and District Electric Supply Bill last Session was £221.

Lowestoft.—The East Anglian Light Railways Order is to be offered for sale by tender.

Oxford.—The T.C. on April 15th adopted an agreement with reference to the system of tramways for the city. Three lines are to be on the conduit system, and the remaining lines on the overhead system. The rental to be paid to the Council for the tramways when electrified, is to be £1,100 per annum for 42 years.

Quarry Bank.—At a meeting of the U.D.C. on Thursday evening of last week, another pronouncement was made with regard to the light railway which is to connect Quarry Bank, Brierley Hill and Rowley Regis. Powers for the construction of the line are vested in the Rowley Regis Council, and it is suggested that this Council, seeing that it is not prepared to take steps for the construction of the railway, should hand over its powers to the Quarry Bank and Brierley Hill Councils. The matter has been discussed by a joint committee, consisting of representatives of the three Councils, and it has been decided to call another conference of the Joint Committee, in the hope that the Rowley Council will co-operate in carrying out the construction of the railway.

Rhyl.—It is understood that the Light Railway Commissioners do not intend to proceed with the consideration of the application for an order to construct a light railway from Rhyl to Prestatyn until the Council of the former town withdraws its opposition. The recent elections in Rhyl leave opinion on the Council evenly divided.

Rochdale.—The working of the Corporation electric cars last year having proved much more satisfactory than in previous years, the Committee has decided to ask for a rate of 1d., a decrease of 1½d. on the rate granted last year. The total income of the tramways, including Heywood, for the year, was £57,270, against £56,557 for the previous year. The gross profit was £25,417; after meeting charges for interest on capital (£11,432); sinking fund (£9,557); and leases on the lines (£1,862), there was a net loss of £189, but £400 was spent on painting poles. The loss in the previous year was £1,352.

South Shields.—At a meeting of the Tramways Committee on the 15th inst., the question of the energy consumption for tramway purposes came up again for consideration. The tramways manager presented a detailed report, showing the amount of energy consumed per car-mile as recorded by meters for the last two years. He suggested that the tramways department should be charged for the energy consumed during the past two years on the average consumption per car-mile shown by the meters during the 11 days since the makers' examination, or on the average for a full month. A long discussion took place, during which it was mentioned that the electrical engineer had suggested that the electricity department should offer the tramways department £1,072 in full settlement. Ultimately it was decided to refer the tramway manager's recommendations to the Electrical Committee, both Committees to report separately to the Council.

In connection with the projected Tyne tube and the proposal that North and South Shields should jointly guarantee interest on £100,000 debenture stock, it is now suggested that the North-Eastern Railway Co. might be induced to join the Corporations, and a deputation is to interview the directors on the subject.

U.S.A.—A single-phase railway, 77·5 miles long, has been put in operation between South Bend, Ind., and Pullman, Ill.; it is known as the Chicago, Lake Shore and South Bend Railway, and possesses 48 passenger cars and 13 goods cars. Each of the passenger cars is equipped with four 125 H.P. Westinghouse single-phase motors, arranged for multiple-unit control. The voltage on the trolley wire is 6,600 volts, except in towns, where it is 700 volts, single-phase, no direct current being employed. The cars are provided with both wheel and pantograph collectors, the latter being used only for 6,600 volts, while the former is used at either voltage. There are 10 sub-stations, two of which are fed at 33,000 volts.—*Electrical World*, N.Y.

Wallasey.—The returns of the year's working of the tramways to March 31st, 1909, show that 932,000 miles were run, and 8,977,726 passengers carried, giving receipts amounting to £45,689, these figures being an increase of £2,743 in receipts, 646,788 passengers, and 40,460 car-miles over those for the previous year. The three routes worked by the Council are all paying ones, having average receipts of 12·25d., 11·38d. and 11·30d. per car-mile, and the results generally are an improvement on the previous year.

York.—The statutory meeting under the provisions of the York Light Railways Order, for the consideration of the alternatives of municipalisation and leasing in regard to the tramways was held on the 16th inst. in the Guildhall, and was crowded to overflowing. Alderman Meyer, vice-chairman of the Tramways Committee, explained the provisions of the order and the nature of the tenders received, and the town clerk indicated the effect of the three propositions which were submitted to the meeting. Clause A provides for complete municipalisation; Clause B for the construction of lines and the leasing of the working; Clause C for both construction and working by a private company. On being put to the vote Clause B failed to find a single supporter, and the municipalisation clause was carried by the enormous majority of nearly 10 to 1 as against Clause C. The Lord Mayor then declared Clause A carried. A requisition was at once handed in on behalf of the non-municipalisers for a poll of the city on the matter, and it is expected that the poll will take place on April 30th, the latest date possible; the earliest date being April 26th.

TELEGRAPH and TELEPHONE NOTES.

Canada.—The Manitoba and Alberta Governments have decided to build 800 miles each of new telephone lines. The rates on all telephone lines in Manitoba have been reduced 20 per cent.

Colombia.—According to the Diplomatic and Consular Report on the finances of Colombia, issued April, 1909, the receipts from posts and telegraphs in 1907 amounted to $335,644, and the expenses to $889,076, resulting in a deficit of $553,431. The receipts from telegraphs were very much more than the estimate, whilst the actual disbursements of the Exchequer during the year for the two services combined were a good deal less.

Fire Brigade Calling System.—The whole of the members of the Walton Fire Brigade are now connected up with an electric call system. By breaking the glass at Walton, Hersham or Oatlands fire stations, all the men can be rung up simultaneously.

The Gamewell fire alarm system has been installed at Windsor Castle, and by this means the members of the Royal Fire Brigade who live in the town will be called up in the event of an outbreak of fire occurring.

Telegraphic Interruptions:—

Port Arthur-Chifu	March 9, 1904
Pontianak-Saigon	Sept. 16, 1908
Tourane-Amoy...	Jan. 19, 1909
Obock-Djibouti	April 15, 1909

Telegraph Clerks' Conference.—The annual conference of the Postal Telegraph Clerks' Association took place at Southampton at the end of last week. In his opening address the chairman, Mr. R. H. Davis, expressed the dissatisfaction of the Association with the concessions made by the authorities as the result of the Hobhouse report. A report recommending the formation of a National Federation of Postal and Telegraph Associations was referred back to the branches for further consideration. Resolutions were passed condemning the leasing of telegraph lines to newspaper proprietors, favouring the abolition of Sunday duty by females in trunk telephone departments, and demanding equal pay for men and women doing equal work. Other resolutions were adopted, and it was decided to hold the next conference at Sheffield.

Telephone Aerial Cable Fire.—On Sunday last a chimney in Nassau Street, W., caught fire, and the flame reached to such a height that the overhead telephone cables were set on fire and burned out.

U.S.A.—The report of the American Telephone and Telegraph Co. shows that, at the end of the year, the company owned 3,215,246 stations, an increase of 179,712, and 5,043 exchanges. The mileage of wire increased by 1,220,126 miles to 9,830,718 miles. The total daily telephone connections were 18,963,000, or at the rate of 6,106,000,000 per annum. There are over 70,000 shareholders in the various companies owned by the Bell system, and nearly 100,000 employés.

Wireless Telegraphy.—Writing to the *Times Engineering Supplement* recently, Mr. A. S. Sörensen replied to a suggestion by Prof. Fleming that the Poulsen generator of high-frequency oscillations was not in commercial use; he stated that for more than a year such an apparatus had been in regular daily use at Cullercoats, communicating with the Danish Poulsen stations. A statement signed by Prof. H. Stroud and Mr. H. Morris-Airey, of the Physical Department, Armstrong College, was appended, in which the writers say that they were present on March 25th at Cullercoats, when the Poulsen arc was at work totally unattended for 1½ hours, taking a current of 9 amperes at 480 volts from the town mains. Except that the spirit vessel was refilled after ¾ hour, the apparatus was not touched, and the arc was still working perfectly at the end of the test. Mr. Sörensen adds that a small Poulsen arc at the same station, which takes 200 watts, has for a long time been in daily use for continuous working periods of at least 4 hours, and regular reliable communication has been obtained with Esbjerg station, 350 miles away.

The U.S. Navy Department will soon open a wireless station at Porto Bello, Isthmus of Panama. The station will be used for general naval purposes, and, in addition, official messages of the Isthmian Canal Commission will be transmitted between Porto Bello and the wireless station at Colon.—*Electrical World*, N.Y.

Experiments with wireless telegraphy from the new station of Rouge Terre, a few kilometres from Cherbourg, have been successfully carried out. Messages were exchanged with the Mediterranean Squadron and the Eiffel Tower.

A wireless telegraph station is being erected at Stoneywood; it will be the most northerly station in Scotland.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—SYDNEY.—May 31st. Two 4,700-K.V.A. turbo-alternators, with condensing plant, &c., and one 447-K.V.A. ditto, for the Council's electricity supply department. See "Official Notices" March 12th.

Austria.—VIENNA.—An inquiry has been received at the British Consulate-General at Vienna from a firm in that city who desire to get into communication with British firms that could completely equip a factory for the manufacture of incandescent electric lamps, or supply the machines and apparatus for their manufacture. Communications from British firms referring to the above should be addressed to the British Consulate-General at Vienna.—*Board of Trade Journal.*

May 14th.—The Nordbahn Direction requires tenders for an electric lighting installation, &c.

Belfast.—April 24th. Circulating pump and motor for the Laganbank Road pump house of the Tramways and Electricity Committee. See "Official Notices" April 2nd.

Belgium.—BRUSSELS.—May 7th. Tenders for the electrical cables and accessories for the municipal electric supply services will be opened at the Hotel de Ville on May 7th. A deposit of £40 is required, and specifications may be obtained for 5d. from the Administration de la Ville de Bruxelles.

Bradford.—April 28th. Cooling towers for the Corporation. See "Official Notices" April 9th.

Broomhill (Northumberland).—Installation of street lighting by electricity, for Chevington East P.C. Current supplied by local colliery; aerial wiring upon creosote poles, with about 80 up-to-date lamps. Mr. Gibson, surveyor, 94, Queen Street, Amble.

Cape Colony.—OUDTSHOORN.—The Oudtshoorn Electrical Lighting Co., Ltd., are inviting tenders for the installation of an electric lighting plant. Full particulars may be obtained from the Secretary, Mr. G. Koelewijn, P.O. box 47, Oudtshoorn.

Denmark.—COPENHAGEN.—May 3rd. Tenders for the Lighting Corporation for the supply of about 48,200 metres of alternating-current cables of various dimensions and for various voltages. The cables are to be of lead, sheathed with iron wire. Tenders for certain fittings and accessories are also called for. Tenders to Direktoren for Belysningsvaesenet, Raadhuset, Copenhagen, and marked "Tilbud paa Vekselstroms-Kabler." Conditions and specifications (in Danish) to be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Dublin.—April 30th. Electrical works and supplies for the Commissioners of Public Works for their various buildings in Dublin and vicinity. Deposit £1. H. Williams, Secretary, Office of Public Works, Dublin.

France.—PARIS.—April 30th. The Ministère des Postes et Télégraphes requires tenders for rubber and fireproof cotton-covered copper wire and for seven lots of telephone receivers, for rural districts.

April 28th.—The Under-Secretary for Posts and Telegraphs requires tenders for telegraph apparatus and material, and for Morse and other tape.

LILLE.—May 21st. The Atelier de Construction du Departement de la Guerre at Douai requires tenders for a 120-H.P. generating set, composed of a gas engine and accessories and a dynamo.

Germany.—DRESDEN.—May 21st. The municipal authorities require tenders for (A) copper wire, (B) metal-filament lamps of 100, 200 and 300 C.P. Particulars may be obtained by sending stamped envelope to the Kanzlei des Betriebsamts der Gas, Wasser und Elektricitatswerke Am Sec. 2.

BREMEN.—May 3rd. The Deputation für die Erleuchtungs und Wasserwerke of the town requires tenders for an 800-KW. transformer complete for a sub-station, and particulars are obtainable against P.O.O. for 4s. from the said office.

Gillingham.—Tenders are invited for the installation of an electric call system for the Fire Brigade. Mr. W. R. W. Hussey, Chief Officer, Gillingham.

Glasgow.—April 26th. The T.C. electricity department invites tenders for one year's supply of gas and steam tubes and fittings. Mr. W. W. Lackie, engineer.

Hertford.—May 8th. 25-B.H.P. electric motor and gearing, for the Corporation. See "Official Notices" to-day.

Leeds.—Electric installation, dynamo, &c., complete (about 300 lights). Write M. 140, *Yorkshire Post*, Leeds.

Limerick.—April 23rd. Stores for the Electricity Committee. See "Official Notices" April 16th. Date, originally fixed April 16th, has been extended as above.

London.—HACKNEY.—May 6th. Cables, troughing, &c. See "Official Notices" March 12th.

April 23rd.—Installation of telephones and fire-alarms at the South-Western Fever Hospital for the Metropolitan Asylums Board. See "Official Notices" April 9th.

HAMMERSMITH.—The Electricity Committee has been authorised to purchase on the most favourable terms up to 10 tons stock of cable.

L.C.C.—May 4th. Withdrawing 18 miles of low-tension lead-covered cables now laid and jointed in stoneware ducts, and relaying and jointing about 15 miles of low-tension lead-covered cables, &c.

Roumania.—The town authorities of Grozavesti require tenders for generating station plant, estimated at £80,000.

Shipley.—April 27th. Electric invalid lift for Sir Titus Salt's Hospital. See "Official Notices" April 9th.

Spain.—MADRID.—May 6th. The Post and Telegraph authorities are inviting tenders for the concession for the working of the urban telephone system at Manresa during a period of 15 years.

Tenders are required for the exploitation of telephones in the Balearic Islands, and must be delivered to the Mayor of Palma de Mallorca by May 17th. The Civil Government of the Province of Pontevedra will receive, till May 5th, tenders for the exploitation of the telephones at Vigo.

June 8th.—The Almeria Harbour Board requires tenders by June 8th for six electrically-worked cranes, estimated to cost 18,915 pesetas. A deposit of 2,160 pesetas is required.

Sunderland.—April 29th. Cables for the Corporation tramways. See "Official Notices" April 9th.

Stockport.—Stores for the Electricity and Tramways Departments. See "Official Notices" April 16th.

Salford.—April 29th. Private telephone installation at the Town Hall for the T.C. Borough Engineer.

Swansea.—April 23rd. Motors and starting switches, for the Corporation. See "Official Notices" April 9th.

Whitehaven.—Feeder pillars and lamp columns for the Corporation. See "Official Notices" April 16th.

Woodbridge.—June 1st. The U.D.C. wants to hear from a company that would establish electric light works in its district, and light the streets electrically. See "Official Notices" March 26th.

CLOSED.

Clacton-on-Sea.—The U.D.C. has accepted the tender of Messrs. Herbert Morris & Bastert for a 13-ton travelling crane for the electricity works, at £165.

Cleckheaton.—The Higher Education Committee has accepted the tender of Mr. G. W. Birkett for the electric light installation at the new Secondary School and Technical Institute.

Darlington.—As the maximum capacity of the generating plant at Darlington Corporation electricity station is 800 KW. and the maximum demand during the past winter, excluding traction, was 790 KW., and there is a possibility of a large increase amongst power consumers, a decision was arrived at a few weeks ago to increase the generating plant by the installation of a 500-KW. electric generator driven by an exhaust steam turbine. This turbine will take its steam from the existing engines and deliver it to the condensing plant, and it is estimated by the electrical engineer that the same amount of steam will be made to generate 30 to 40 per cent. more electricity than at present. The following 16 tenders have been received:—

Brush Electrical Engineering Co.	£2,000
British Westinghouse Electric & Manufacturing Co.	2,670
C. A. Parsons & Co.	2,850
Belliss & Morcom, Ltd.	2,880
J. Howden & Co.	2,958
Fraser & Chalmers, Ltd.	3,228
Electric Construction Co.	3,260
" " (alternative)	3,320
" " (alternative)	3,375
British Thomson-Houston Co.	3,505
Willans & Robinson, Ltd.	3,800
Siemens Bros. Dynamo Works	3,860
Richardsons, Westgarth & Co.	3,980
Musgrave & Sons	3,898
P. J. Mitchell	3,950
Electrical Co.	4,150

It is understood that the contract for the work will be let in the course of the next two or three weeks, after the Committee has received a report from the engineer as to the result of a visit paid to the exhaust steam turbine plants now in operation at the municipal stations at Weymouth and Weston-super-Mare.

Germany.—LEIPZIG.—Tenders vary in Germany as much as they do over here, as shown by the following list of tenders received by the municipality of Leipzig for the electric lighting of one of the public buildings:—

	Marks.
Oskar Schöppe	52,652
Elektr. Anlagen Gesellschaft	42,950
Louis Zentsch	39,110
Schimpfermann & Co.	36,405
Eugen Blanke	35,664
Lange Nachfl.	34,150
Gebrüder Kaiser	33,856
Ehrling	31,808
Sächsische Baugesellschaft	29,839
Schubert & Co.	29,678
Hermann Pöge	29,336
Hopfer & Eisenstuck	28,464
Brüggemann & Lewus	28,092
Siemens Schuckertwerke	26,531
Schumanns Elektrizitätswerk	25,687
Elektrotechnisches Werk Leipzig Voigt & Mühler	25,540
Hardegen & Co.	22,583

Grays.—The U.D.C. has accepted the tender of the Brush Electrical Engineering Co., Ltd, for pumps for the surface water drainage scheme, at £379.

Kabul.—*Indian Engineering* reports that one of the engineers of Messrs. F. & C. Osler, Ltd., was to leave Calcutta for Kabul (Afghanistan) about the end of last month to put up an extensive electric installation at the Amir's Palace, which in the near future is to be lighted with Osler's electroliers which are now in use in several palaces in India. "The engineer is also to report on a proposed hydro-electric scheme for Kabul. We also learn that the same firm are laying down electric light installations for the old and new palaces at Patiala, the generating power of which will be gas suction plant, which, owing to its superior merits as regards economy, is rapidly gaining in popularity."

London.—BERMONDSEY.—The B.C., on 15th inst., accepted the tender of Messrs. W. Geipel & Co. for the supply of arc lamp carbons of Henrion make, ¼ 201 quality, for the year.

HAMMERSMITH.—The following are the tenders submitted for additional panels for the main switchboard:—

British Westinghouse Co.	(recommended)	£124
Switchgear, Ltd.		150
Spagnoletti, Ltd.		160
Cowans, Ltd.		176
Johnson & Phillips		180
Ferranti		192

The tender of Mr. H. F. Harrison for 30 street lanterns and brackets, at 14s. 6d. each, is recommended for acceptance.

Lowestoft.—The T.C. has accepted the tender of Messrs. Crompton & Co., Ltd., for a 250-KW. set, at £1,313.

Middleton.—The annual contract for motors has been placed with Messrs. Veritys, Ltd., for their Aston interpole motors.

Newport (Mon.).—The T.C. has accepted the tender of Messrs. Dick, Kerr & Co., Ltd., for three tramcars, at £2,140.

Stockport.—The fittings for the Stockport Sunday School (oldest and largest Sunday school in the country) have been ordered from Messrs. Veritys, Ltd., by Messrs. John Collier & Co., contractors. The consulting engineer is Mr. G. E. Fletcher.

Swindon.—The T.C. has accepted the following tenders:

H. Pooley & Son.—Weighbridge, £79.
Worthington Pump Co.—Softener pump, £31.
Crompton & Co.—Circulating pump, £109.
Babcock & Wilcox, Ltd.—Superheater, £175.
Brook, Hirst & Co.—Switchgear, £46.
Evershed & Vignoles, Ltd.—Megger, £23.

Wolverhampton.—The B. of G. has accepted the tender of the District Electric Co. for installing the electric light at the extensions at the Nurses' Home, at £113, and that of the Premier Accumulator Co. for the maintenance of the battery at the House, at £37 10s. per annum.

The District Electric Co., Ltd., of Wolverhampton, have received instructions to carry out the electric lighting installation for the Queen Square Improvement Syndicate.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Mann, Egerton & Co., Ltd.—Mortgage or charge dated April 1st, 1909, to secure £2,000, charged on the company's mortgage or charge of £2,000 (subject to anterior charge of £4,000) on freehold premises at Norwich. Holders: Barclay & Co., Ltd., Lombard Street, E.C. (In effect, this is a transfer of a charge for £2,000 held by the company.)

Nairobi Electric Power and Lighting Co, Ltd. (87,728).—A memorandum of satisfaction in full on March 26th, 1909, of charge dated January 23rd, 1907, securing £16,000, has been filed.

W. H. A. Robertson & Co., Ltd. (95,906).—This company's annual return was filed on March 12th, when 300 shares had been taken up out of a nominal capital of £6,000 in £10 shares. £2,855 has been paid, leaving £145 in arrears. Mortgages and charges: Nil.

Kilowatt Publishing Co., Ltd. (90,715).—Particulars of £2,500 debentures created February 5th, 1909, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the first issue (on April 1st) being £1,450. Property charged: The company's undertaking and property, present and future, except uncalled capital. No trustees.

Héroult Electric Furnace Plant.—The electric iron-smelter of the Noble Electric Steel Co. at Héroult, Cal., is about to be started up. The cost of electrical energy at Héroult is $12 a horse-power or $16 per KW.-year. It is stated that in an experimental furnace which made several test runs last year, 1½ tons of iron were produced per day at a cost of $4·20 for electrical energy per ton of pig-iron. With the larger furnace now nearing completion, there will be produced from 15 to 20 tons of pig-iron a day, with an expenditure, it is believed, of $4 per ton for electrical energy. It is claimed that iron can be made at the plant for $16 a ton. The electric smelting furnace for iron ore consists of a concrete stack 20 ft. high, with electrodes fixed in the walls of the crucible, the charging being done from the top, so that a long column of charge is preheated before it reaches the fusion zone between the electrodes. The electrodes are 24 in. apart.—*Electrical World*, N.Y.

, 1909.

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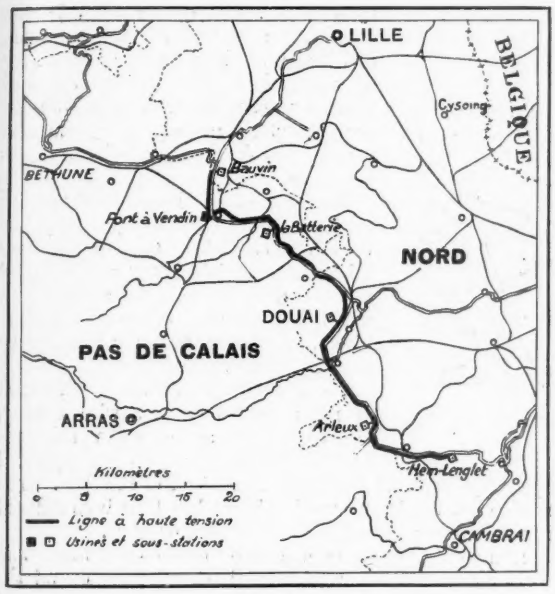
The 45,000-Volt Transmissions of the Compagnie Electrique du Nord, France.

In view of the inconvenience attending a poorly installed transmission line, both in respect of troubles to generating machinery and uncertainty of service, the installation of a 45,000-volt line for the Compagnie Electrique du Nord presents unusual interest, from the diversified character of the work and the care taken to obtain the best results in what is a pioneer enterprise of its kind in this part of France.

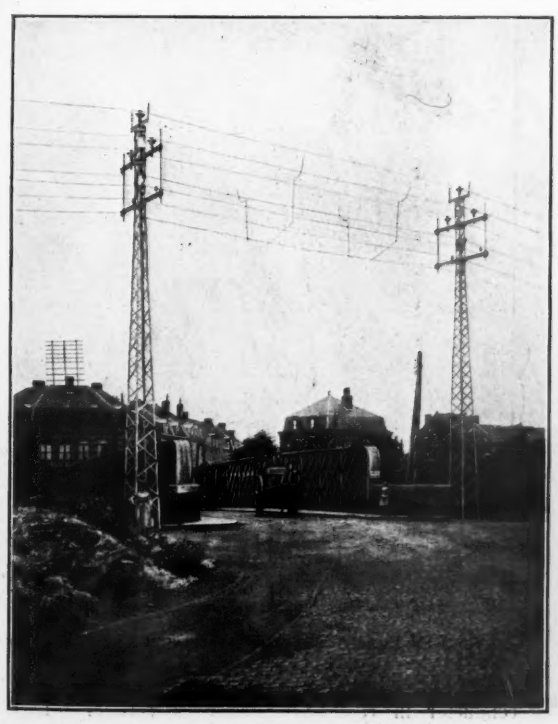


Plan of Transmission Routes.

Type of 45,000-volt Insulator Employed.

The company which exploits this district supplies energy produced at the Lens coal mines and also works a concession, through an affiliated company, for the electric haulage of boats over some 52 miles of canals in the district. Thus the condition was almost imposed upon the constructors to place their transmission lines along the canals, where a concession was already in existence for the placing of the poles. To this and the fact that the line crosses seven railway tracks, is due the varied design of the towers used in the construction.

The total length of the transmission line is 32 miles, and Pont à Vendin may be taken as the centre of the network. There are two three-phase 50-cycle networks extending from this place, each for 45,000 volts, and another

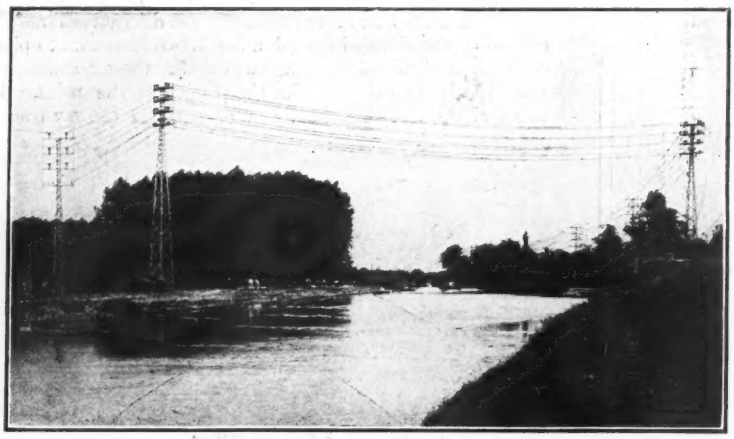


A Road Crossing, Showing Guard Netting, &c.

A Railway Crossing, Showing Towers and Guard Netting, &c.

5,000-volt line runs to Corbehem. From Douai to Hem Lenglet there extends one three-phase 50-cycle 45,000-volt line.

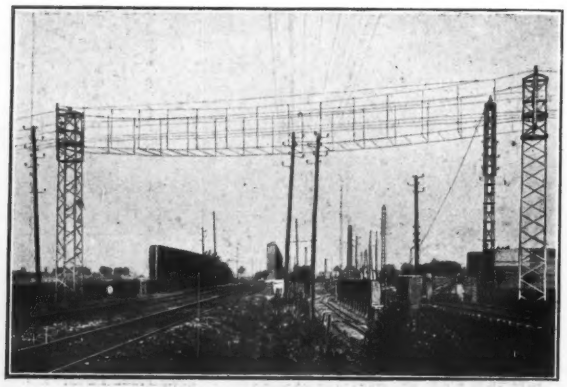
The form of tower differs considerably, according to the district traversed or obstructions met on the way; all the supports are of steel trellis construction, and have a normal spacing of about 220 ft. The towers supporting



Transmission Line Crossing Canal.

nine conductors have a total weight of 15 cwt., and those carrying six or three conductors weigh 10 cwt. These weights are for the towers ordinarily used, but in the special towers far heavier weights are met with. For instance, the 75-ft. towers used for carrying the conductors crossing the canal weigh nearly 3½ tons, and those used to support the wires over the railways weigh 2½ tons. These latter are rectangular in form, whilst the towers for the passage of the canal are pyramidal. The last-mentioned support a weight of 155 ft. of nine conductors, the lowest of which is 54 ft. above the level of the canal water in the summer, and 56 ft. in winter. The canal was crossed in order to avoid certain houses and trees. These towers have a section equal to 4 sq. m. at the ground level, and were transported to the spot in parts and assembled. A special tripod was used for their erection.

Some 30 cb. m. of rubble was excavated to allow for the foundations, and the level being below that of the water in the canal, some troublesome cofferdam and drainage work was necessary. Advantage was taken of the frost, however, to do a part of the work.



Transmission Line Crossing Railway.

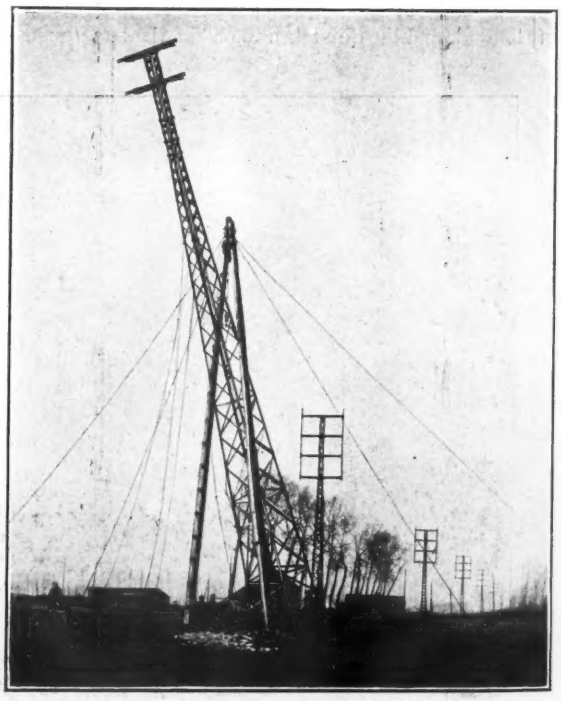
All the towers are solidly embedded in a block of concrete, varying in size according to the strains to be supported and the size of the tower. When erected, each tower was carefully grounded by means of a deeply buried zinc plate connected to a fixed conductor attached to one corner of the steel work.

The 45,000-volt porcelain insulators are triple petticoated, enamelled brown, weighing 20 lb., and the outside diameter of the largest petticoat is 1 ft. They were tested at the works before shipment at 110,000 volts each, and each petticoat was separately tested at 70,000 volts. They were also subjected to sudden variations of temperature and to mechanical stresses, and are cemented to iron supports. Wherever the profile of the line presents any appreciable angles the conductors rest on a double series of insulators, and the towers are also of a stronger type in these cases. All the conductors are of copper wire, 7 mm. dia., with a section of 38·4 sq. mm., and have a breaking strain of 85 lb. per sq. mm. The conductors are supported under a mechanical tension of 330 lb., that is, 8·6 lb. per sq. mm.; tempered copper ties hold them on to their insulators.

Wire netting has been placed beneath the lines wherever railways or public roads are crossed. The netting over railroads is especially heavy, and is applied at seven different points, necessitating a much heavier type of tower at these places, to support the strain involved by the use of the semi-rigid nets.

For the passage over the canal, which is not protected by any wire netting, the conductors are of extra thickness (40 sq. mm. section), and are supported by a triple series of insulators at each end of the span. The mechanical tension on the insulators has thus been reduced to 3·5 lb. per sq. mm. section of conductor cable.

Iron spikes have been placed round each tower and danger notices have been placed prominently on all the supports. Another precaution has been to install vertical iron guards at each side of the cross-arms on which are mounted the insulators, in view of the possible fall of a



Method of Erecting 24-m. Transmission Tower, Compagnie Electrique du Nord.

conductor in case an insulator is broken. Lightning arresters have been installed in the generating and receiving transformer stations at either end of the lines. The insulators were placed in position after the conductors were stretched between towers. The work was carried out by the French Thomson-Houston Co., and the several views given show to some extent the constructional methods adopted.

ELECTRIC LIGHTING AT GLANUSK PARK.

An interesting electrical installation has recently been carried out at Glanusk Park, Crickhowell, the residence of Lord Glanusk, situated some eight miles from Abergavenny.

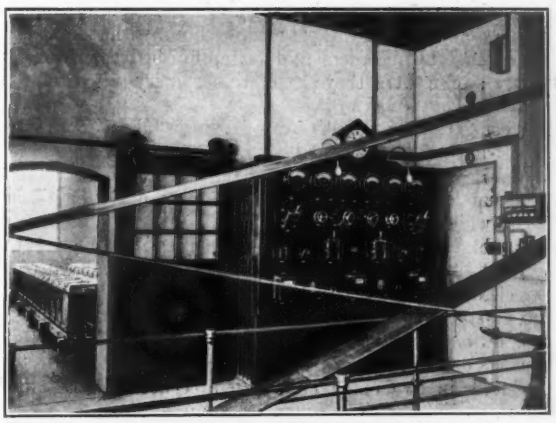
For the housing of the generating plant, three rooms in the estate workshops have been utilised; these workshops are some 200 yd. from the farm buildings and about a quarter of a mile from the house and stables, which are in close proximity to each other.

The generating plant includes two Morris-Hawkins dynamos belted to two suction gas engines of 49 B.H.P. each, by Tangyes, installed in one room with the main switchgear, also the gas producers and a Tudor battery in the other two rooms.

The battery is of 390 ampere-hour capacity, having a normal discharge of 65 amperes over 6 hours, so that the chance of breakdown is reduced to a minimum; it consists of 116 cells arranged in single tiers only, on wooden stands provided with wooden trays and fluid oil insulators. Ten cells are connected to the regulating switch on the board by means of insulated-rubber cables run on insulators and treated with anti-sulphuric enamel.

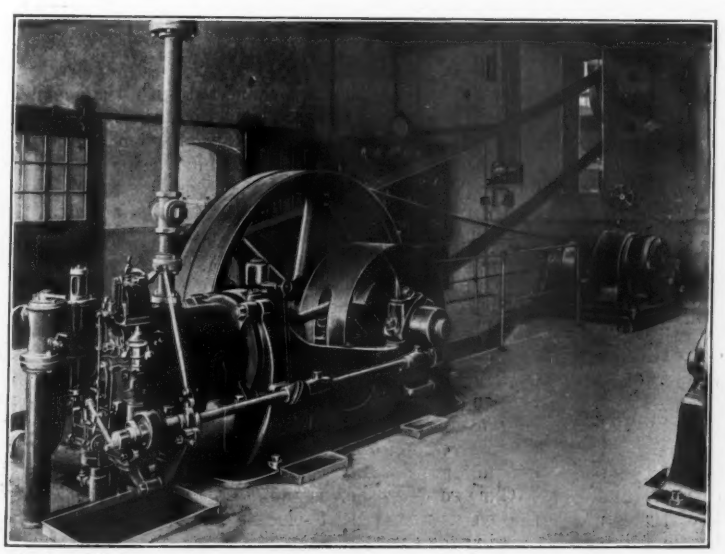
The dynamos are of the shunt-wound protected type, each having an output of 22½-KW. with a pressure of 300/200 volts.

Striking gear is provided to enable the machine shop shafting to be run irrespective of the dynamos. The switchboard is so arranged that the machines can, if necessary, supply the bus-bars in parallel, or singly, whichever is required; it is also possible to run the lighting direct from the dynamos, from the battery, or to charge and discharge simultaneously.



The Main Switchboard and Battery Room.

Interior of Drawing Room, with Crystal Candelabra, &c.



View in Engine House, showing Gas-driven Generator, Switchboard, &c.

In each dynamo circuit, and in the discharge circuit, besides the usual measuring instruments, there are fixed Chamberlain & Hookham ampere-hour meters to check the input and output of the battery, but in other respects the switchboard is in accordance with the ordinary practice for similar installations, and therefore does not require explanation.

From the engine room an underground paper-insulated armoured concentric cable is laid to the house, tappings being taken off this for the bothies and stables. Two-core telephone cables, laid in the same trench, connect the house with the stables and engine room, and these, by a suitable switching arrangement, can be used as a voltmeter connection for recording the house voltage at the engine room, should this be necessary. The farm buildings and estate office mains are of hard-drawn bare copper wire, run overhead on telegraph poles, each line at the engine room end being protected by lightning arresters.

The main switchboard in the house, situated at the termination of the concentric main, near the servants' hall, consists essentially of three double-pole switches and fuses, suitably mounted and controlling the south and north residential parts of the house, and the servants' quarters, thus dividing the wiring into three sections. In each of these sections there are two sub-fuseboards, one on the ground floor and one on the first floor, the latter being looped from the bus-bars of the former through fuses. From the sub-fuseboards the branch wiring is carried to the various lamps and switches in multiple-parallel and series-parallel where metallic-filament lamps are employed. The wires are run partly in continuous screwed steel piping, and partly in wood casing impregnated to render it fireproof, the former being used chiefly where structural altera-

tions were taking place, and in rooms and passages where the presence of a surface casing or pipe would have been unsightly. In the reception rooms and best bedrooms the switches and bell-pushes are sunk flush with the plaster and covered by an ornamental plate, finished to match the fittings; elsewhere they are of the ordinary raised tumbler type.

A considerable amount of care has been taken in selecting the ornamental fittings, and where any particular period is emphasised in the decoration and furniture, fittings showing the same characteristics have been chosen. The dining room, which is in the Adams style, is lit by gilt Adams candle brackets, and provision has been made, as regards the dining table, for using electric candles or any table decorative effects which may be required. In the drawing room, two crystal candelabra form the chief feature of the lighting, in addition to which there are two old French wood-gilt brackets on either side of the fire-place. A pretty effect is produced in two china cupboards by concealed "Linolite" lamps.

Fittings chiefly of Georgian style have been used in the hall, vestibules and other rooms. The hall itself and first floor landing are lighted by three-light electroliers erected in the corners, so as not to interfere with the well of the house, but leave it clear right up to the glass dome at the top, above which lengths of "Linolite" lamps, with suitably arranged reflectors, are fixed, giving an exceedingly pretty opalescent light at night.

In all the rooms mentioned above, plugs are arranged at intervals in the skirting, for use with standard lamps or any other electrical appliance which does not require a large amount of current. These are of the flush type, and are controlled at the doors.

The lighting of the bedrooms is effected partly by two-light counterweight pendants, and partly by candle standards on the dressing tables, plugs being fixed in either case for bedside standard lamps. Most of the bedrooms have two-way switching to at least one of the light points, for controlling from the bed as well as from the door.

A large portion of the lamps and candles throughout the house have carbon filaments, the voltage for transmission purposes being 200, but tantalum lamps have been used where it was found possible to arrange two in series.

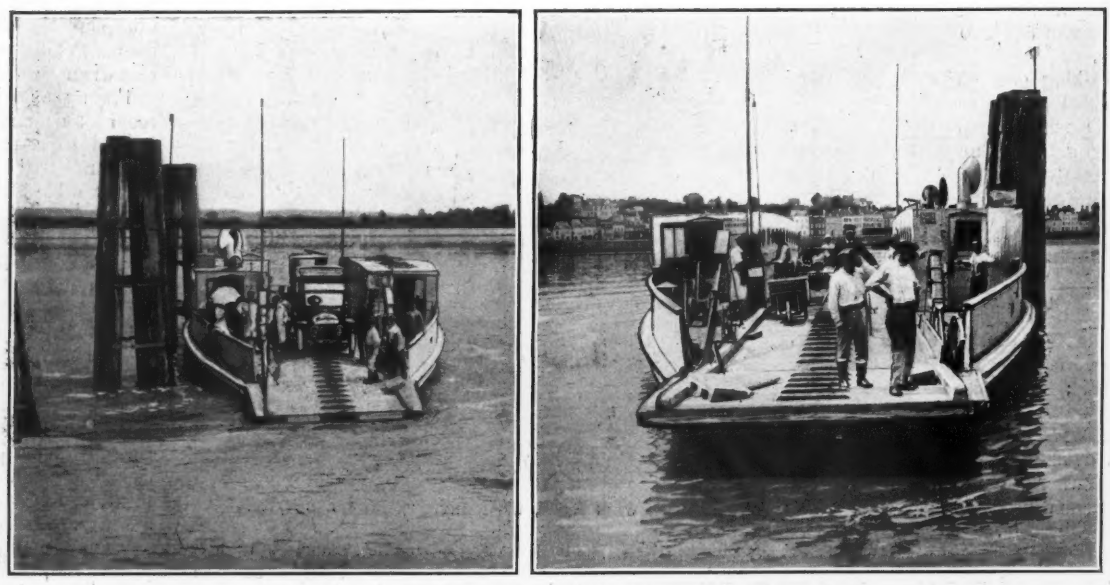
Besides electric light, the residential part of the house has been fitted with a complete system of electric bells, to take the place of the old mechanical bells, the wiring being protected by light gauge steel conduit, and indicator boards have been fixed on the ground and first floors. The bedrooms have pushes ringing to either of these boards, so that a prompt service is ensured.

The whole of the electrical work has been carried out by the Cardiff branch of Messrs. J. B. Saunders & Co., of Westminster, under the supervision and to the specification of Messrs. Morgan Williams & Couzens, consulting engineers, Victoria Street, S.W.

A FRENCH PETROL-ELECTRIC FERRY-BOAT.

By DR. ALFRED GRADENWITZ.

As an imperfect substitute for bridges, about fifteen ferries of different kinds are installed between the City of Rouen and the mouth of the River Seine. The most important of these are three steam ferries of identical construction, which have for some time been in operation in Duclair, Candebec and Quilleboeuf respectively, doing very good service at the two former places. At Quilleboeuf, however, which is the last ferry station before the mouth of the river, the latter is so broad and the tide so marked that a reconstruction of the old-fashioned ferry proved absolutely necessary, the more so as this ferry is used by the many automobiles travelling on the high road along the Norman coast.



Views of the Petrol-Electric Ferry at Quilleboeuf on the Seine.

Owing to the difficulties connected with the installation of steam boilers, the company exploiting the ferry discarded the old mode of operation by means of steam engines; nor could benzine or petroleum-operated motors be used directly for the propulsion of the ferry boat, as this was fitted with slowly rotating paddle wheels. The possibility of using electricity was, therefore, considered, but as accumulator operation would have proved too expensive, a purely electric service was not found desirable.

The company, therefore, decided on adopting the system of mixed operation which has been used lately with much success in connection with automobiles and railway motor-cars, an explosion motor being used to drive a dynamo, which in turn supplies power to a motor serving to propel the vessel. This arrangement allows the explosion motor to be used alternatively for direct or indirect operation according to circumstances.

Our two views show the unloading of an automobile from the reconstructed petrol-electric ferry, and the same ferry crossing the river.

The hull of the reconstructed ferry is made entirely of iron, and consists mainly of two longitudinal beams carrying the bottom of the vessel, and connected by very substantial transverse beams. At the two ends, the bottom of the ferry, which is flat in the middle part, rises at an obtuse angle forming watertight compartments with the sides and

special bottoms, those parts of the ferry being most subject to injury in the case of collision. To the right and left respectively of the main beams, there are two beams carrying the cabins. The planking constitutes a very robust sheath protecting the paddle wheels.

Two cabins are arranged on the deck of the vessel, one of which is a closed hall with benches for 20 to 25 passengers; at the end of this hall is situated a compartment for the sailor in charge of the vessel.

The other cabin, which is located in front of the former, is taken up entirely by the machinery and the tools required for the upkeep.

The track for loading the cars is 3 metres in width and 24 metres in useful length, its two ends being hinged with a view to facilitating the loading. Those ends are readily lifted or lowered by means of winches.

The ferry is steered alternately from either end, the direction of travelling being changed sometimes even during the passage. The rudder fitted at the fore end of the vessel is arranged to fold up by means of a system of hinges against the bottom of the vessel, so as to avoid injury when the ship touches the river bank. This is effected at a moment's notice by a simple controlling lever.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

"H" Type Double-Pole Switch.

Messrs. Geo. M'Cartney & Co., of Burnside Works, Cumnock, N.B., have brought out a new type of switch for motor work, shown in the accompanying illustration, in which the blades are arranged to work in the same plane. The movement adopted gives a quick and long break, and the blades cannot remain in an intermediate position between on and off. The design is such that, in the act of opening, the effort is applied close to the jaws of the

Fig. 1.—"H" Type Double-Pole Switch.

switch, not at the pivots; there is no slot for the handle in the cover, the operating spindle sliding through small holes, so that the switch is completely enclosed and suitable for use in exposed positions. Owing to the construction adopted, the cast-iron case projects but little from the wall or panel to which it is fixed; the case is completely lined with asbestos, and the joint with the lid is made with this material also.

Grooving Trolley Wire.

Mr. Barnes Kay, of 262, Blackburn Road, Haslingden, has sent us particulars of a device which he has invented for grooving and flanging a round trolley-wire by hand, after it has been suspended in position. This apparatus is shown in the accompanying illustration, fig. 2. It consists of a bar having a groove, in which the wire is clamped, and a sliding carriage which carries cutting wheels. The carriage is provided with rollers to keep the wire firmly in place, the pins upon which the rollers turn being taper, so that they are easily removed to put the wire in position. The wheels, which have V-shaped edges, are forced inwards by screws, and the carriage is moved to and fro on the wire, grooving and flanging the latter. It is claimed that by this means the use of ordinary mechanical ears on round wire is made possible without removing any metal from the wire; as the ears are not soldered, the wire is not softened. The ears cannot creep along the wire, which is grooved for the length required for the ear only. A larger

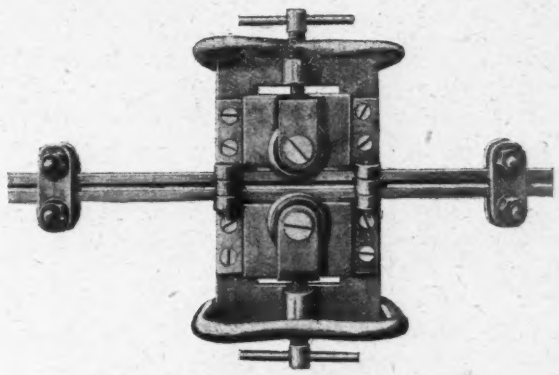


Fig. 2.—Kay's Patent Grooving Machine.

bearing surface is obtained than with figure-8 wire, and the system can be applied to existing lines without expert labour. We are informed that several Corporations are adopting the machine.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN.—Addition to surgery pavilion at Royal Infirmary; the Medical Superintendent.

ABERGAVENNY.—Reconstruction of Asylum; E. A. Johnson, architect, St. Mary's Chambers, Abergavenny.

ACCRINGTON.—School at Peel Park; W. J. Newton, surveyor, Accrington.

ACREFAIR (near Ruabon).—New English Calvinistic Methodist Chapel (seat 500).

ASHBURTON.—School; P. Morris, architect, Richmond Road, Exeter.

ASHTON-IN-MAKERFIELD.—New chancel at Holy Trinity Church; Rev. W. Williams, rector.

ASPULL (near Wigan).—Shop and houses, Woodfield Street, for T. H. Platt.

ASTON (Birmingham).—Extension of works for Tubes, Ltd.

AUCHTERDERRAN.—Renovation and extension of the infants' school; W. Williamson, architect, 252, High Street, Kirkcaldy.

AUGHTON (near Sheffield).—New Council school (£1,552).

BACUP.—Roller skating rink, Stacksteads (£600), for the Rossendale Rink Co., Ltd.

BAKEWELL.—Alterations and enlargements at the Peacock Hotel; E. H. Garrett, licensee.

BANFF.—Additions and alterations to Strathaven Lodge, Gordon-Richmond Estate; A. Thomson, architect, Fife-Keith.

BATH.—Extensions and improvements at the Pump Room Hotel.

BARTON-ON-IRWELL (near Manchester).—Additional blocks of property J. Owen, estate agent, Church Street, Eccles.

BELFAST.—Additional buildings at the Purdysburn Villa Colony Asylum; Graeme-Watt & Tulloch, architects, 77A, Victoria Street, Belfast.

BINGLEY.—Hostels for students; J. Vickers-Edwards, County Hall, Wakefield.

BISHOP'S WALTHAM.—New Primitive Methodist Chapel (£650).

BLACKBURN.—Ice Works (£10,000), for the Blackburn Crystal Ice Co.; Sames and Green, architects, Richmond Terrace, Blackburn; Wm. Edmundson, builder, Bolton Road, Blackburn.

BLACKROD (Lancs.).—Proposed restoration of the Parish Church (£2,000); Rev. G. W. Coleman, vicar.

BOLTON.—New offices for the Beehive Spinning Co., Great Lever; Potts, Son and Hennings, architects, St. George's Road, Bolton. New libraries for the T.C.; Bradshaw & Gass, 19, Silverwell Street, Bolton, and Henderson & Brown, 2, Fold Street, Bolton, architects.

BOWHILL (Fife).—New church (seat 600); Minister, Bowhill U.F. Church.

BRADFORD.—Probable re-erection, after fire, of works, Drewton Street, for Rawnsley & Adams, waste pullers.

BRAINTREE.—Villas, London Road Estate, for G. Hunnable; Rayne Road, for G. A. Gage.

BRIGHOUSE.—Skating rink, Atlas Mill Road; Thos. Kershaw, architect, L. & Y. Bank Chambers, Halifax.

BRISTOL.—Restoration of St. Luke's Church, Barton Hill, and new mission hall.

BUILTH WELLS.—New cattle market and offices in New Street; T. Smith, architect, 5, Market Hall Buildings, Builth Wells.

BURNAGE (near Manchester).—Extension of chain works for Hans Renold, Ltd.

BURNLEY.—New nurses' home for the B. of G. (£4,800).

BURSLEM.—Flint mill in Scotia Road, for the Burslem Mills Co., Ltd. Additions to Sunday School, Liverpool Road, for the Trustees of the Hill Top Chapel.

BURY ST. EDMUNDS.—Sanatorium for consumptives.

BUXTON.—Proposed conversion of Old Wye House into pupil teachers' centre; Alderman Oakes, Chairman of the Derbyshire Education Committee, Derby.

CANTERBURY.—Houses, Martyr's Fields, Wincheap; J. S. Dadds, builder, Beer Cart Lane, Canterbury.

CARDIFF.—Six houses, Cathedral Road; J. H. Venning, builder, Cathedral Road.

CARNARVON.—Alterations and additions to the Liberal Club; R. L. Jones, architect, 14, Market Street, Carnarvon.

CARRINGTON (Notts.).—Proposed new Church; Rev. H. L. Wild, Vicar of Carrington.

CHARD.—New Baptist Chapel; T. Dare, Pastor.

CHATHAM.—Houses, Wyndham Road, Dale Street, for H. J. Taffs; Chatham Hill, for H. R. Richardson; Holcombe Road, for W. Warner; Bungalow, Walderslade, for Mr. Dean.

CHELMSFORD.—Public lavatory in the High Street; W. Smith, Town Clerk, Municipal Offices, Chelmsford.

CHELTENHAM.—Probable re-erection, after fire, of business premises, Suffold Road, for White Bros., grocers (damage, £1,500).

CHURCH (Lancs.).—Extensions to weaving mill, for J. Barnes, Ltd. New Council offices, Blackburn Road; W. E. Wood, Church.

CLEVEDON.—Structural and lighting alterations to Christ Church; Rev. Stuart Cox.

COLNE.—Technical and secondary school (£4,500); T. H. Hartley, architect, Colne.

CONWAY.—Council school at Glanwydden; R. L. Jones, architect, 14, Market Street, Carnarvon.

COOKHAM.—Electric power house, Shottlesbrook, for G. O. Smith.

CORRINGHAM (Lincolnshire).—Primitive Methodist Church; E. P. Green, architect, 24, Silver Street, Gainsborough.

CURRY RIVEL.—Additions and alterations to Burton Pynsent House; Peltard & Son, builders, Langport.

DALBEATTIE (N.B.).—Probable rebuilding, after fire, of Hardgate U.F. Church.

DARCY LEVER (near Bolton).—Proposed parish church house; Rev. H. J. Adams, vicar.

DARFIELD (near Barnsley).—Sewage disposal scheme for the U.D.C. (£6,500); D. Balfour & Son, engineers, St. Nicholas Buildings, Newcastle-on-Tyne.

DERBY.—Extensions, including new workshops and bakehouse, to the Borough Asylum; B. S. Jacobs, architect, Lincoln's Inn Buildings, Bowlalley Lane, Hull.

DESBOROUGH (Northants).—Extensions to factory, Queen Street, for W. & E. Turner.

DEVIZES.—Engineer's house at the County Asylum; J. G. Powell, county surveyor, Trowbridge.

DEVONPORT.—Sunday school at St. Mark's Church, Ford; Hine, Odgers and May, architects, 23, Lockyer Street, Plymouth.

DONCASTER.—Colliery developments, Barnby Dun, by a local syndicate.

DOVER.—Houses, West Langdon, for H. P. Hampton; Temple Ewell, for F. A. Tunbridge, builder, Alkham.

DUDLEY.—Alterations to premises for Moyle & Co.

DURHAM.—Three houses, Church Street, for Geo. Taylor; public building and shops in Claypath, for the Durham Hippodrome Co., Ltd.

EASTLEIGH (Hants.).—Stable, dairy, &c., for H. Taylor, dairyman, Eastleigh; alterations to bakehouse, Brixey & Sons, bakers, Eastleigh. Fourteen houses in Southampton Road; Hetherington & Co., builders, Surbiton, Surrey. Seventeen houses in Cranbury Road; Goater & Elliott, builders, Eastleigh. London and South-Western Railway Institute (£5,000); Macintosh and Newman, architects, Birkbeck Bank Chambers, High Holborn, W.C.

EASTON (near Winchester).—New Primitive Methodist chapel and school (£500).

EDENDERRY (King's County).—Schools for the Rev. J. Kearney; F. Bergin, architect, 36, Westmoreland Street, Dublin.

ENFIELD.—New church buildings for the Christ Church Mission, Lancaster Road Parish Buildings, Enfield Lock (£1,100); J. S. Aldar, architect, 1, Arundel Street, Strand, W.C.; J. Bentley & Sons, builders, Waltham Abbey.

EXETER.—Carnegie Library for the T.C. (£15,000). Training College; J. Harvey, architect, Bampfylde Street, Exeter.

FARNHAM (Surrey).—Church house (£2,670); A. G. Mardon, builder, 68, Castle Street, Farnham.

FIFE.—Proposed baths for miners; Manager, Fife Coal Co.

FILEY.—New Masonic Temple.

FOLKESTONE.—New premises at 25, Sandgate Road, for Sainsbury, Ltd., provision dealers (£3,000). Flats, 2, 3 and 4, Westbourne Gardens, for N. M. Salter; A. Bromley, architect, Folkestone. Alterations to 2, Albion Villas; R. Pops, architect, Folkestone. (Electric light to be used in all of these buildings.) New church at Morehall; Rev. W. E. Allen, vicar.

FRODSHAM.—New Mortuary; S. J. Davies, architect, Rural Council Offices, Runcorn.

GILLINGHAM.—Shops, High Street, for J. Davidson; W. E. R. Randall, architect, 171, High Street, Chatham.

GLASTONBURY.—Reconstruction of the entrance gate houses at the Abbey; Mr. Carôe, Diocesan architect.

GONNOW (Burnley).—School; G. H. Pickles, architect, Town Hall, Burnley.

GOSPORT.—New licensed premises, Priory Road and Green Lane, Hardway, for Brickwood & Co., Ltd., Catherine Brewery, Portsmouth.

HAMILTON.—Secondary and technical school; P. Keith, clerk to the School Board, Hamilton.

HELSTON (Cornwall).—Residence at Mullion for S. Aitken, J.P.

HENBURY.—Railway station buildings and warehouses; Engineer, G.W.R., Paddington, W.; H. Lovatt, contractor, Wolverhampton.

HINCKLEY.—Public baths (£2,348); E. H. Crump, engineer, Council Offices, Hinckley; G. Greaves, builder, Hinckley.

HINDLEY (near Wigan).—Congregational Church; H. Wade, architect, 27, Birley Street, Blackpool.

HONLEY (Yorks.).—New Primitive Methodist Sunday School.

HORBURY (near Wakefield).—Additions to Chapel at House of Mercy, for the Mother Superior.

HORLEY (Surrey).—Factory at Salfords, for the Lanston Monotype Corporation, Ltd., 42, Drury Lane, London, W.C.

HUDDERSFIELD.—New Primitive Methodist manse. Probable rebuilding, after fire, of Bayhall Mills, Birkby; Stork Bros., yarn spinners, and D. J. Green, woollen manufacturer, joint occupiers.

HYDE.—Additions to works, Dawson Street, for Messrs. Redfern.

ILFORD.—Theatre, Ilford Lane; B. Crewe, architect, 75 and 77, Shaftesbury Avenue, London. Skating rink, Ilford Hall, for A. J. Archer. Shops, Green Lane, for Rawlins, Culver & Ryland.

JERICHO (near Bury, Lancs.).—Ten houses, for R. Berry, Ltd., Jericho.

KEIGHLEY.—New sewage disposal works; J. McKay, contractor, Derby.

KINGLASSIE (Fife).—New U.F. Church; Minister, U.F. Church, Kinglassie

KING'S LYNN.—New elementary school (£6,000); Architect, Education Authority, Guildhall, King's Lynn.

KINGSTOWN (Co. Dublin).—Proposed new library, for the U.D.C.

KIRKCALDY.—Reconstruction of property in Rosslyn Street, for J. Cowie.

LANARKSHIRE.—Nurses' home at Middle Ward Hospital, near Motherwell; A. Cullen, architect, Brandon Chambers, Hamilton.

LANCASTER.—Five dwelling houses in Bridge Road; R. Baines, builder, Meadowside. Dwelling house and shop in Sibsey Street; E. Parkinson, Ashfield Estate. Four semi-detached houses, Church Avenue, Scotforth; R. Thompson, builder, Dalton Square.

LEIGH (Lancs.).—New premises, for the British Petroleum Co., Ltd. Proposed skating rink; J. Barnes, Morecambe. Sixteen houses, St. Helen's Road; J. Boydell.

LEWES.—Stores, Bridge House, for Walker & Co.

LINCOLN.—Houses, Pennell Street, for S. & R. Horton; Scorer Street, for the Lincoln Land and Building Society; Tealby Street, for W. Priestley.

LINTHWAITE (Yorks.).—Nine houses, Manchester Road, for B. S. Butterworth.

LITTLE HULTON (near Bolton).—Proposed public mortuary in Peel Lane; J. T. Davies, surveyor to the Council.

LIVERPOOL.—Extension of Royal Southern Hospital (£8,500); Haigh and Thompson, architects, Exchange Street, Liverpool.

LLANDAFF.—Forty-two houses in Heathfield Road, and thirty-six houses in Heathfield Place; O. T. Morgan, builder, Whitchurch Road, Cardiff. House and bakehouse, Edington Avenue; E. Abbott, builder.

LLANDRINDOD WELLS.—Six houses, Montpellier Park, for Edwin Holt; A. Swash, architect, Midland Bank Chambers, Newport (Mon.).

LONDON (Bromley, E.).—Alterations at the District Sick Asylum, Devons Road; J. & W. Clarkson, architects, 136, High Street, Poplar, E.

(Barking, E.).—Proposed extension of St. Paul's Church and new parish hall, &c. (£5,000).

(Hackney, N.E.).—One shop and dwelling-house, and nine houses, Daubeny Road; one shop and dwelling-house and 18 houses in Durrington Road; Leeks & Blake. Workshop in Sewdley Street, and additions to 190, Millfields Road; W. L. T. Brown. Four houses and shops, 306–312, Mare Street, and four houses and shop, Morning Lane; C. Winkley. Buildings in Hertford Road; Gordon, Wilson & Co. Warehouse, &c., 39, Castle Grove; C. Castle & Son. Extension of mains to the Royal Edinburgh Laundry, Paragon Road, for lighting and power. Extension of mains to 14, Darnley Road, for lighting and heating.

(Shoreditch, N.E.).—Warehouse, stable, &c., at 5 and 7, Rushton Street. Nine blocks of model dwellings in City Road and Catherine Street, for the Sutton Trustees.

(Upper Clapton, N.E.).—Boiler house, coal store, &c., at factory premises, Sach Road; W. J. Fryer & Co.

(Tottenham, N.).—New school in Crowland Road (1,420 children); G. E. T. Lawrence, architect, 22, Buckingham Street, Adelphi, W.C.

(Cricklewood, N.W.).—Church in St. Michael's parish (£10,000); Rev. T. D. Lloyd, vicar.

(W.C.).—Adaptation of part of old Holborn Town Hall, Gray's Inn Road, for branch of the National and Provincial Bank of England; 112, Bishopsgate Street Within, E.C.

(Barnes, S.W.).—Six flats, South Worple Way; A. Harvey, builder, Lowther Estate, Castelnau, Barnes. Converting 1 to 3, Cottesmore Villas into shops; Foyer & Co., solicitors, 36, Essex Street, Strand, W.C. Two houses, Beverley Path; E. J. Partridge, architect, Bank Chambers, Richmond.

(W.).—Extensions of premises of Fortnum & Mason, wine merchants, &c., 183, Piccadilly. Building in Brewer Street; Godson & Sons, builders, Pembroke Works, Kilburn Lane, N.W. Buildings in Piccadilly; W. Johnson & Co., Ltd., builders, Wandsworth Common, S.W. Buildings, Oxford Street and Rathbone Place; Prestige and Co., builders, 149, Grosvenor Road, S.W.

(Silvertown, E.).—Probable rebuilding (after fire) of Cairn Mills, Factory Road, for Loders & Nucoline, Ltd., edible oil refiners.

(E.).—Adaptation of 79-81, Aldgate, and 1, Minories, for branch of London & South-Western Bank; H. J. Williams, Ltd., builder, 11-17, Bermondsey Street, S.E.

(Deptford, S.E.).—Repairs (after fire) to barrel factory, Church Street, for Messrs. Murphy.

(E.C.).—Building, Cheapside and Wood Street; Trollope & Colls builders, 5, Coleman Street, E.C.

(N.).—Additions to the Industrial Home for Jewish Girls, 69, Stamford Hill.

LOWESTOFT.—Store, Belvedere Road; C. & E. Morton, Belvedere Road, Lowestoft. Four houses, May Road; Mrs. J. H. Clarke, May Road, Lowestoft. Eight houses, Worthing Road; Mobbs Bros., builders, Gordon Road, Lowestoft. Additions to laundry, Whapload Road, for the Lowestoft Steam Laundry Co.

LYTHAM.—Proposed electric lighting of St. Cuthbert's Church; Rev. Canon Hawkins, vicar.

MACCLESFIELD.—Renovation and restarting of silk mill in St. George's Street by Messrs. Vavasser, silk manufacturers, Nichol Street, Bethnal Green, London.

MANCHESTER.—Baths and wash-houses, Armitage Street and Miles Platting, for the T.C. (£20,000). Rebuilding the Star Hotel, Deansgate. Renovation, after fire, of the Pack Horse Hotel, Bridge Street. Insurance premises, St. Mary's Gardens; H. Fairhurst, Spring Gardens, Manchester.

MANSFIELD.—Three houses (£945); A. E. King, architect, Bishop's Chambers, Mansfield; Vallance & Blythe, builders, Mansfield. Proposed extension of the workhouse for the B.G. (£9,000).

MANVERS MAIN (Yorks.).—New collieries at Barmbro for the Manvers Main Colliery Co.

MARGATE.—Proposed E.L. installation at St. John's Church.

MICHAELSTON-LE-PIT.—Four semi-detached villas, New Road; A. Davies, builder.

MIDDLESBROUGH.—New free library, for the T.C. (£16,000).

MIRFIELD (Yorks.).—Re-erection, after fire, of the West Riding Flour Mills, for Stott Bros. (damage, £20,000).

MONTROSE.—Proposed electric lighting of Dorward's Institution; the managers.

MOSSLEY (near Manchester).—Proposed new Catholic Church (£3,000).

MOSTON (near Manchester).—New United Methodist Church at Streetfold.

NELSON.—Alterations and additions at Great Marsden School; Director of Education, Nelson.

NEWCASTLE.—St. James' Hall, St. Andrew's Street (seat 2,560); P. L. Browne, Pearl Buildings, Northumberland Street, Newcastle.

NEW DELAVAL (Northumberland).—New premises for W. Willson, Ltd.; J. Potts & Son, architects, 57, John Street, Sunderland.

NEWQUAY.—New county school; B. C. Andrew, architect to the Cornwall Education Committee, Biddick's Court, St. Austell.

NEWTON ABBOT.—New Wesleyan Sunday School at Decoy.

NEWTON BEWLEY (near Middlesbrough).—Rebuilding Blue Bells Inn; F. Smith, owner.

NEWTOWN.—Six semi-detached villas, for Francis Knapp.

NORTHAMPTON.—Proposed town and county school; Norman & McKewan, architects, 4, Wood Hill, Northampton. Probable re-erection, after fire, of premises in Mercers' Row, for Neudegg & Son, Ltd., house furnishers (damage, £5,000).

OAKHAM.—Wesleyan manse at Cold Overton Road; five houses, Dean Street, for Thos. Hibbett.

OLD TRAFFORD (Manchester).—New skating rink; Burgess & Galt, contractors, Ardwick, Manchester.

OPENSHAW (Manchester).—Extensions at engineering works; Armstrong, Whitworth & Co.

OTHERY.—Rebuilding Congregational Church; F. Davis, builder, Middlezoy.

OXENHOPE (Yorks).—Additions to works (£850); J. Haggas & Sons, architects, North Street, Keighley.

PERTH.—Reconstruction of property in South Methven Street, for J. Calder and Co., brewers, Alloa. Alterations in South Methven Street, for T. Roy, butcher.

PITLOCHRY (PERTHSHIRE).—Alterations at Bonskeid House, for G. F. Barbour (£3,000); Bell & Cameron, architects, Pitlochry.

PLYMOUTH.—Conversion of factory, Millbay, into skating rink, for Rinkories, Ltd.

POLMONT (STIRLINGSHIRE).—Alterations to established church manse; Rev. J. B. Mackenzie, The Manse, Polmont.

POOLE.—Baptist mission hall in Wimborne Road, Longfleet, in connection with Hill Street Church.

PORTMADOC.—Proposed new church and new parsonage at Pentrefelin (£5,000); Rev. J. E. Williams, vicar. Additions to Snowdon Street schools; R. L. Jones, architect, 14, Market Street, Carnarvon.

PORTSMOUTH.—Two shops, Elm Grove; Mr. Davis, 7, Cottage Grove, Southsea. Houses, Ringwood Road; F. V. Lanton, Ivanhoe, Milton Road, Portsmouth. Six houses, Balfour Road; E. Payne, builder, 6, Munster Road, Portsmouth.

PRESTON.—X-ray department at Preston Royal Infirmary; F. E. Dixon, architect, 49, Lune Street, Preston.

PRESTWICH (LANCS.).—New Church house.

READING.—Alterations and additions to the "May Duke" (public house), North Street. Four pairs of semi-detached houses in Melrose Avenue, for H. J. Prouten. Six houses in Brisbane Road, for H. Fabrey. New school in Fairmead Road, Shinfield, for the trustees of the Free Church.

RESOLVEN (GLAM.).—New Welsh Calvinistic Methodist Church.

RICHMOND-ON-THAMES.—Six houses, Chilton Road, for G. H. Lay; four houses, Leybourne Park, for E. W. Taylor.

RINGSEND (Co. DERBY).—New St. Patrick's R.C. Church.

ROMFORD.—Development of new estate, and erection of 30 houses at Hornchurch, for Mr. Gower.

ROTHERHAM.—Eight dwelling houses, Selbourne and Lindley Streets; 12 houses, Cavendish and Hartington Roads; Chas. Green's Sons, builders, Wellgate, Rotherham.

RUNCORN.—Twelve houses, Grange Road, for J. T. Williams, Liverpool.

RUTHERGLEN.—Model lodging house in King Street.

RUTHIN (NORTH WALES).—Proposed new fire station, &c.; Borough Surveyor, Ruthin.

ST. ANNE'S-ON-THE-SEA.—New Baptist Church in St. Andrew's Road; Smith & Matley, architects, Manchester.

ST. DAY (CORNWALL).—Premises at Lanner Green; J. Tiddy & Son, builders.

SALTBURN.—New Primitive Methodist Church (£5,200); Baines & Son, architects, 5, Clement's Inn, London, W.C.; J. G. Porteous, builder, Guisborough.

SANDGATE.—Hospital quarters (£3,000); Selby & Saunders, architects, Westminster; H. W. Grigg, builder, Dover.

SELBY.—Extensive works; Wm. Irwin & Co., builders, Burley Road, Leeds.

SHEERNESS.—Prospective rebuilding, after fire, of the White House Sailors' Home.

SHEFFIELD.—Proposed new Wesleyan Church (£2,500).

SHREWSBURY.—Renovation, after fire, of cabinet works, for J. & B. Blower.

SKEGNESS.—Refuse destructor for the U.D.C. (£1,900).

SOUTHEND.—Proposed extension of St. Erkenwald's Church.

SOUTHPORT.—New church at Blowick.

SOUTH SHIELDS.—Shop alterations to 200 and 202, Stanhope Road, for S. Moody; J. M. Dingle, architect, Ocean Road, South Shields.

STAMFORD.—New shops and buildings for the Peterborough Equitable and Industrial Co-operative Society, Ltd.; Townsend & Fordham, architects, Cross Street, Peterborough.

STANDISH (near WIGAN).—Four villas in Wigan Road; J. Pennington.

STANFIELD (STAFFS).—Additions to Wesleyan Church; Ford & Slater, architects, Burslem.

STIRLING.—Alterations at Gargunnock Manse; Rev. R. Stevenson.

SUDBURY.—New Roman Catholic School, The Croft; G. Grimwood & Sons, Acton Square, Sudbury. Four houses, Queen's Road; G. C. Gooday. Six houses, Constitution Hill, for Geo. Smith; A. A. Hunt, architect, Sudbury.

SUNNINGDALE (BERKS).—Public hall (electric mains in the vicinity); Norris and Co., builders, Sunningdale.

SURBITON.—New Council schools at Tolworth for the Education Committee.

SWADLINCOTE.—Shop, Granville Road, for S. Whittaker; bakery and stores, Hastings Road, for J. Bottoms.

SWANSEA.—Eight houses, Hawthorne Avenue, for J. W. Thomas; suite of offices in Cambrian Place, for C. Marles; lodging house in Fisher Street, for S. Gunning.

SWINDON.—Additions to brewery, High Street, for R. B. Bowly & Co., Ltd.; seven houses, Edgware Road, for Tydeman Bros., builders, Edgware Road.

SYMINGTON (LANARKSHIRE).—Proposed public hall; Councillor W. C. Martin.

TAUNTON.—Garage and shops in East Street, for Taunton Motor Co. Rebuilding premises in Fore Street, for the National and Provincial Banking Co.; H. J. Spiller & Son, builders, Taunton. New building for Messrs. Marshalsea, boot manufacturers; G. C. Strawbridge, architect, Alma Street. Alterations to Victoria Street Wesleyan Church; F. W. Roberts, architect, 2, Hammet Street. Additions to 6, Hammet Street, for C. P. Clarke; F. W. Roberts, architect. Three houses in Gyffard Street, for Mr. Rendell; G. P. Alexander, architect.

THORNHILL (near DEWSBURY).—Houses, eight in Long Causeway, for R. Thompson; six in South Street, for Edwin & Peter Ellis; five in Edge Lane, for W. Wood; nine in Ravensthorpe Road, for M. Broadhead & Partners, builders, Thornhill Lees.

TILSTON (near MALPAS).—Primitive Methodist church and schools; J. H. Pickard, architect, Whitchurch; Vickers & Sons, builders, Tilston.

TOTTINGTON (LANCS.).—Extensions at Tottington Mills; S. Knowles & Co., Ltd.

TRIMINGHAM (near NORTH WALSHAM).—Primitive Methodist Church; A. F. Scott, architect, 24, Castle Meadow, Norwich.

TROEDYRHIW (GLAM.).—Six pairs of semi-detached houses, for the Bronheulog Building Club; T. E. Rees, architect, Gernant, The Walk, Merthyr Tydfil.

TRURO.—Proposed new chapel at the Home of the Community of the Epiphany. Alterations and additions to premises, 26, 27 and 28 Richmond Hill and Boscawen Road, for Doney, Son, Watts & Co.; N. F. Blamey, architect, Bodmin Road, St. Austell. New County Offices (£19,361); Silcock & Reay, architects, 47, Milsom Street, Bath.

TUNSTALL.—Enlargement of bakery, &c., High Street, Golden Hill, for C. Lovatt.

TWICKENHAM.—Roller skating rink at St. Margarets; H. Little, builder, 24, The Barons, Twickenham.

WAINFLEET (LINCS.).—Proposed Co-operative Society premises.

WALKDEN.—Three houses, Manchester Road; Harrop & Hughes, contractors, Kay Street, Walkden. Surface developments, at Wharton Hall Collieries; J. Wallwork, mining agent to Lord Ellesmere, Bridgewater Offices, Walkden.

WALTON-ON-NAZE.—County school (£7,000); J. H. Nicholes, Education Secretary, Chelmsford.

WARRINGTON.—New elementary school in Liverpool Road; Director of Education, Warrington.

WATERLOO (near LIVERPOOL).—Houses, Cambridge Road, Seaforth, for Mrs. E. G. Oliver; Royton Road, for J. Houghton.

WATFORD.—Skating rink in Clarendon Road, for Mr. Sylvester, managing director, Palace Theatre; two new churches in Durham and Wiggenhall Roads.

WEST BARNES (SURREY).—New Baptist Church in Seaford Avenue.

WEST HARTLEPOOL.—Additional machine room, &c., to *Northern Daily Mail* Printing Works, Clarence Road; W. & T. R. Milburn, architects, Fawcett Street, Sunderland.

WHALEY THORNS (DERBYSHIRE).—Alterations and extensions at St. Luke's Church.

WHITCHURCH.—Fifteen houses, Newfoundland Road; G. Burgess, builder, Whitchurch.

WIGAN.—Offices for H. Mather; new Post Office and shop, A. T. Heaton; new branch for Manchester and Liverpool District Banking Co.

WIGTON (CUMBERLAND).—Gymnasium, laboratory and workshop at the Friends' school, Brookfield, for the Governors.

WILMSLOW (near MANCHESTER).—Two shops, Church Street, for H. Glossop.

WINCHCOMBE.—Sewerage and sewage disposal works for the R.D.C. (£7,000); Willcox & Raikes, engineers, Birmingham.

WOLVERHAMPTON.—Proposed works for the Knowles Oxygen Co., Ltd., 13, King Street, Wolverhampton. Twelve houses, Dunstall Road; J. Carding, builder, Albert Road, Wolverhampton.

WORKSOP.—Houses (18), Garden City, for Mr. Lobley; six in Elm Street, for Mr. McCarrick.

WORTHING.—Warehouse; J. Lund, architect, Christchurch Road, Worthing.

YARMOUTH.—Additions to Vauxhall public house, Runham, for Morgan and Co.; eight houses, Clarence Road, Gorleston, for J. and R. Chaston; alterations to shop, Regent Street, for Boots, Ltd.; alterations to shop, Feathers Plain, Gorleston, for J. A. Bussey.

YEADON (near LEEDS).—Probable re-erection (after fire) of premises, Silver Lane, for J. Lee & Sons, furnishers and upholsterers.

YEOVIL.—Probable re-erection (after fire) of premises in Reckleford, for Pratt & Co., chemists' sundrymen, and F. Blake & Co., glove manufacturers (damage £2,000).

YIEWSLEY.—Alterations to Anchor public house.

YNYSDDU.—Twenty houses for the Ynysddu Building Club; D. J. Thomas, architect, High Street, Blackwood, Mon.

YORK.—Sewerage and sewage disposal works for the T.C. (£57,658).

YSTRAD MYNACH.—School-room for the Independent Home Mission; T. Roderick, architect, Clifton Street, Aberdare.

FORTHCOMING EVENTS.

Institution of Mechanical Engineers.—Friday, April 23rd.—At 8 p.m. Presidential address.

Royal Institution.—Friday, April 23rd. At 9 p.m. Paper on "Tantalum and its Industrial Applications," by Mr. A. Siemens.

Physical Society.—Friday, April 23rd. At 5 p.m. At the Imperial College of Science, South Kensington. Papers on "Want of Symmetry Shown by Secondary X-Rays." by Prof. W. H. Bragg and Mr. J. L. Glasson; "Transformations of X-Rays," by Mr. C. A. Sadler; and "The Theory of the Alternate-Current Generator," by Prof. T. R. Lyle.

Institution of Civil Engineers.—Friday, April 23rd. At 8 p.m. Students' meeting. Paper on "The Development of Hydro-Electric Power Schemes, with Special Reference to Works at Kinlochleven," by Mr. J. M. S. Culbertson.
Monday, April 26th.—At 8 p.m. Seventh "James Forrest" lecture on "Road Motors," by Col. H. C. L. Holden.
Tuesday, April 27th.—At 8 p.m. Annual general meeting.

Institution of Municipal Engineers.—Saturday, April 24th. At Olympia. General meeting.

Faraday Society.—Tuesday, April 27th. At 8 p.m. At the Library of the I.E.E. Papers on "Experiments on the Current and Energy-Efficiencies of the Finlay Alkali Chlorine Cell," by Messrs. F. G. Donnan, J. T. Barker and B. P. Hill; and "The Electromotive Force of Certain Platinum Compounds, with Special Reference to the Oxygen-Hydrogen Gas Cell," by Mr. P. E. Speelmann.

Junior Institution of Engineers.—Visit to ss. *Otaki* postponed to Wednesday, April 28th. 4.39 p.m. train, Fenchurch Street.
Saturday, May 1st.—At 7, for 7.30 p.m. At the Hotel Cecil. Twenty-fifth anniversary dinner. Mr. J. Swinburne in the chair.

Association of Engineers-in-Charge.—Saturday, May 1st. Social. Bohemian Concert.

NOTES.

Electrical Standardising, Testing and Training Institution.—As the result of the examinations held at Faraday House on April 5th, 6th and 7th, the following awards have been made:—

To Richard Willan, of the Municipal Secondary School, Widnes, Lancashire, a Faraday Scholarship of 50 guineas per annum, tenable for three years.

To Cyril L. Underwood, of Bedford Grammar School, an Extra Entrance Scholarship of 35 guineas per annum, tenable for three years.

To John R. S. Hawker, of the Goldsmiths' College, New Cross, London, S.E., an Entrance Exhibition of 25 guineas per annum, tenable for three years.

To Roger Brunton, of Wellingborough Grammar School, a special Entrance Prize of 20 guineas.

Electrical Vehicles in the U.S.A.—An association of central stations and electric motor vehicle companies has just been formed in Boston, U.S.A., with the object of promoting the use of electric motor vehicles for both business and pleasure.

U.S. Patent Law.—The committee in charge of the Payne Bill has announced the omission of the retaliatory patent section.—*Electrical World*, N.Y.

Legal.—London United Tramways, Ltd., *v.* Maldens and Coombe Council.—In the Chancery Division on Tuesday, April 20th, Mr. Christopher James, on behalf of the plaintiff company, moved before Mr. Justice Neville for an injunction to restrain the Urban District Council of the Maldens and Coombe from stopping traffic on the company's system in the road leading to Kingston, by their proposed mode of executing certain sewerage works. Mr. Tomlin appeared for the defendant Council, and contended that the Tramways Act of 1870 provided for the settlement of any such dispute as formed the subject matter of the present motion by arbitration, and offered an undertaking not to interfere with the company's traffic till the arbitration. Mr. James pointed out that there was another question in the action, plaintiff asking for the specific performance of an agreement, and for damages; but, after some discussion, the motion was allowed to stand over until the trial of the action, on the undertaking mentioned by Mr. Tomlin.

In re The Auto-Claw Co., Ltd.—Taylor *v.* The Company.—In the Chancery Division, before Mr. Justice Eve, Mr. Mansfield, on behalf of the plaintiff in this debenture-holder's action, made application for the continuance of the appointment of a Receiver of the defendant company's assets. He stated that there was a considerable dispute with regard to a number of bills, but that did not affect his client, who was a *bonâ fide* debenture-holder for £1,000. Originally he asked for the appointment of a manager as well, but that was not now pressed for.

Mr. Christopher James said he represented other debenture-holders. It was true that the plaintiff was first in point of time, but they did not admit his priority, and he should have something to say as to who should be appointed Receiver.

After some discussion, Mr. Justice Eve continued the Receiver already appointed over Friday next, and gave Mr. Christopher James leave to serve notice of motion for that day for the appointment of a Receiver on behalf of his client.

Appointments Vacant.—According to an advertisement in *Indian Engineering*, applications for the post of chief electrical engineer to the Government of Mysore (£100 per mensem) had to reach Mr. W. McHutchin, secretary to the Government of Mysore Public Works Department, Bangalore, by May 15th. Passage money will be paid. Three years' appointment with option of renewal. Testimonials to be forwarded with applications. Mechanic for making and repairing instruments at the L.C.C. Paddington Technical Institute (42s). Mains assistant for Birmingham (£150). See our advertisement pages this week.

Parliamentary.—In the House of Lords on April 20th, the Durham (County) Electric Power Supply Bill was read a third time and passed.

Electric Shock Fatality.—On 19th inst., at the West Ham Coroner's Court, an inquest was held into the death of Albert Rawlins, aged 32, a french polisher, of Stratford, who on Friday last, according to the evidence, met his death while engaged polishing the panels of a G.E.R. saloon carriage. W. Nash, who was engaged painting in the kitchen of the same carriage, stated that in the course of his work he required to have an electric portable lamp, which was hanging by a book to the roof, removed. He took it down by the handle, and handed it to the deceased, who grasped it by two fingers. The deceased immediately stumbled, "as though he was drunk, and fell dead." Members of the ambulance corps ran to him, and, the current having been cut off, artificial respiration was resorted to, but without avail.

According to the report in the *Morning Advertiser*, Maurice Vice, electrician, in charge of the carriage department of the Great Eastern Railway, said that the pattern of the lamp in question had only been in use for six weeks, and "in consequence of the advice of the Home Office it was intended to discontinue them." The witness had tested the lamp, but could find no leakage; the lamp and lead appeared to be in good condition. He was unable to account for the accident. If the cage protecting the lamp was alive similar accidents could be prevented. He did not think the deceased could have received a shock unless the cage had been alive. The witness did not think a shock at 250 volts serious. On many occasions he had had a shock at 450 volts.

Dr. T. Inglis, who made a post-mortem examination, said the deceased was a perfectly healthy man, and he could find no external sign of injury, but in his opinion death was due to syncope caused by an electric shock. The witness added that both Drs. Harris and Bonnifin, medical electrical experts, agreed that a voltage of 250 was never serious to a healthy man.

The jury returned a verdict of "Accidental death."

Institution and Lecture Notes.—Institution of Electrical Engineers.—The following nominations for the election of Council and officers for the year 1909-10 were to be announced at the meeting yesterday:—

President.—*Dr. Gisbert Kapp.*

Vice-Presidents.—*Sir H. H. Cunynghame, W. Duddell, S. Evershed*, Col. H. C. L. Holden.

Members of Council.—*W. W. Cook, G. K. B. Elphinstone, W. Judd, W. M. Morrison, J. H. Rider, C. H. Wordingham*, Dr. E. Hopkinson, J. W. Jacomb-Hood, T. Mather, F.R.S., Major W. A. J. O'Meara, W. H. Patchell, W. Rutherford, J. F. C. Snell, G. Stoney, A. H. Walton.

Associate Members of Council.—*E. Russell Clarke*, H. Human, J. E Taylor.

Honorary Treasurer.—*Robert Hammond.*

Honorary Auditors.—*H. Alabaster, Sidney Sharp.*

Names in italics are those of new nominees.

Institution of Municipal Engineers.—The roll of the Institution is now 544—503 members and 41 students. A register is to be kept recording the names of members and students seeking municipal appointments, and publicity is to be given to its existence. A general meeting is to be held at Olympia on Saturday, the 24th inst.

Junior Institution of Engineers.—A visit of this Institution was recently paid to the Chingford Reservoir Works of the Metropolitan Water Board, of which we published particulars on March 19th.

Institution of Electrical Engineers (Leeds Section).—The annual general meeting will be held at the University, Leeds, on May 5th. The Committee has made the following nominations for the election of officers:—Chairman—Mr. W. M. Rogerson; Vice-chairman—Mr. T. Harding Churton; Committee—Messrs. A. B. Mountain, W. Hartnell, A. J. Cridge, H. H. Wright and S. W. Schofield; Hon. Sec—H. Dickinson. Further nominations will be received up to Saturday, May 1st. After the election of officers, a paper will be read by Mr. W. F. Mylan on "Electrification of Steam-Driven Non-Reversing Rolling Mills."

Incorporated Municipal Electrical Association.—The preliminary programme of the fourteenth annual Convention, which is to be held at Manchester from Tuesday, June 22nd, to Friday, June 25th inclusive, has been issued. On the evening prior to the commencement of "serious" proceedings—Monday, at 7.30 o'clock, there is to be a reception and conversazione by Lord Mayor Holt at the Town Hall. The arrangements for the other days are as follows:—

Tuesday, June 22nd.—10.30 a.m.—Opening of the Convention by the Lord Mayor at the Municipal School of Technology, Whitworth Street. Presidential Address. Papers and Discussions.
1.15 p.m.—Luncheon at Town Hall to Members and Delegates, by Invitation of the Electricity Committee.
2.45 p.m.—Visits to Works by Special Cars.

Wednesday, June 23rd.—8.55 a.m.—Leave Manchester by Special Train for Liverpool.
10 a.m.—Meeting at St. George's Hall and Address of Welcome by Sir Charles Petrie. Papers and Discussions.
1 p.m.—Luncheon at the Exchange Hotel to Members and Delegates, by Invitation of the Liverpool Corporation Committee.
2.30 p.m.—Visits to Works by Special Cars, and proceed to Pierhead for visit to R.M.S. *Mauretania*, where the Members will be entertained to Tea by Invitation of the Directors of of the Cunard Steamship Co. Ladies are specially invited.
9 20 p.m.—Return to Manchester by Special Train.

Thursday, June 24th.—10 a.m.—Meeting at the Municipal School of Technology, Whitworth Street. Papers and discussions.
1 p.m.—Table d'hôte luncheon, Midland Hotel.
2 30 p.m.—Visit to works.
7 p.m.—Annual dinner at Midland Hotel. Members, delegates and visitors.

Friday, June 25th.—10.30 a.m.—Annual general meeting at the Municipal School of Technology, Whitworth Street. Election of officers and Council, annual report and other business.
1 p.m.—Table d'hôte luncheon, Midland Hotel.
2.30 p.m.—Visits to works.

The following are some of the subjects to be discussed during the convention:—(1) Cheap Units; (2) Metallic-Filament Lamps; (3) Steam Turbines; (4) Cable Systems; (5) Tramways.

The headquarters will be the Midland Hotel, Manchester, where rooms should be booked at once.

Lancashire and Cheshire Municipal Tramway Managers.—The quarterly meeting of the Lancashire and Cheshire Municipal Tramway Managers was held at Burnley on Friday, April 16th, at which the following attended:—H. Mozley (Burnley) chairman, J. M. McElroy (Manchester), J. H. Cowell (Blackburn), W. Clough (Bury), A. T. Eardley (Stockport), T. J. Kendrew (Southport), H. Helme (Nelson), G. W. Holford (Salford), W. Wyld (Birkenhead), R. R. Greene (Wallasey), J. F. Simpson (Preston), R. W. Smith-Saville (Darwen), J. W. Dugdale (Ashton-under-Lyne), and Lewis Slattery (Oldham), hon. secretary. Letters expressing regret for non-attendance were read from a number of other managers.

The members were welcomed at the Town Hall by the chairman of the Burnley Corporation Tramways Committee (Mr. Councillor Aspinall). Several matters of local interest were then discussed, after which a visit was paid to the car depôt and workshops, where the members had the opportunity of inspecting a two-motor bogie car, with body carried wholly on the driving wheels, and the rotating point of the trucks over the centre of the driving axle; a vestibule bogie car, with top cover and cabin; the construction of trucks in progress; mechanical run-back preventer; time meters; wind shield on cars; and an improved bell punch (referred to by Mr. Mozley at the Nottingham Conference).

Regret was expressed that the meeting of the Managers' Section of the Municipal Tramways Association at Newcastle had been fixed for near to the Whitsun holiday, as it would prevent many from attending who were desirous of doing so. The members subsequently partook of tea at the kind invitation of the Mayor of Burnley.

On the invitation of Mr. W. Wyld (the general manager and engineer of the Birkenhead Corporation tramways), it was decided to hold the next quarterly meeting at Birkenhead on July 16th next.

Electricity in Agriculture.—Mr. Low, the proprietor of the Balmakewan estate in the Mearns, Scotland, is a thorough believer in electrical energy in the working of a farm. Erecting a turbine at Luther mains, he first of all lighted the farmhouse. Then the power was transmitted to a sawmill in the vicinity, where a complete set of machinery is daily at work. A machine for cutting stones was set agoing, the laundry machinery was worked by electrical energy, and a more recent innovation is an ice house with refrigerating plant. On the farm proper the threshing mill and other machinery are driven in the same way at a small cost.

The latest experiment, which is being carried out under the direction of Prof. Greig, of the Aberdeen and North of Scotland College of Agriculture, has reference to the electrification of the soil. Sir Oliver Lodge's English experiments in electro-culture having proved successful, Mr. Low has had a transformer fitted up by the Agricultural Electrical Discharge Co., Gloucester, the work being superintended by Mr. J. E. Newman. The electricity is carried by means of wires on poles, about 70 yd. apart, in parallel rows. Between the wires there is an intersecting network of wires, 10 yd. apart. The voltage of the generator is 250 volts, and with an induction coil this is increased to 100,000 volts. In the application of the electric power, the negative terminal is put to the earth, and the positive is connected to the line. The poles which carry the wires are 16 ft. high, so as to obviate any obstruction when ploughing or harvesting operations are in progress. Two areas are to be tried, and in each field there will be an electrified plot as well as a control plot, in order to make comparisons. In Scottish farming circles the keenest interest is taken in the experiment.

Colwyn Bay does not want more Plant.—With reference to the paragraph which appeared on page 632 of our last issue under the heading "Colwyn Bay," Mr. A. R. Tudman, the engineer and manager of the electricity works, sends us the following correction, to which we are pleased to give publicity:—"In your last week's issue you published a paragraph stating that the U.D.C. of Colwyn Bay have decided to install additional plant for tramways. This is not correct, and I shall be glad if you will rectify this error, as I am inundated with letters and representatives of firms wishing to quote."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Lighting Committee of Shoreditch Borough Council has decided to raise the salary of Mr. W. Weekes, who was appointed assistant engineer in September, 1907, at £200, by £25 per annum, with a further increase to £250, 12 months hence.

Mr. J. W. Beauchamp, deputy-manager, of the Sheffield E.L. undertaking, has been recommended by the Committee for appointment as resident electrical engineer at Tunbridge Wells.

Mr. B. Seaborn, of the Colchester Electricity Staff, who is leaving for Canada, has been presented by his colleagues with a kit bag.

We learn that the Marylebone Electric Supply Committee has recommended the appointment of Mr. A. H. Seabrook, M.I.E.E., of West Ham, as engineer and manager of its undertaking at a salary of £800 a year. There were 128 applicants for the office.

The Hackney Electric Lighting Committee have decided in favour of the following officials being placed on the staff at the undermentioned salaries:—Mr. H. G. Barraclough, generating engineer, date appointed June, 1903, present salary £3 per week, proposed salary £156 per annum; Mr. E. Wilkinson, deputy generating engineer, appointed December, 1901, present salary £2 5s. per week, proposed salary, £117 per annum; Mr. E. Mathews, testing engineer, appointed November, 1901, present salary, £2 10s. per week, proposed salary £130 per annum.

General.—On Friday, 16th inst., the Clyde Valley Electrical Power Co., Glasgow, held their annual smoking concert, at which Mr. R. B. W. Pirie, late chief accountant, who is leaving for Vancouver, was presented with a suit case and suitably inscribed gold watch, by his colleagues on the staff, and his many friends amongst consumers of the company, and others. There was a very large and representative gathering, including all the Clyde Valley staff who could be present, many representatives of the electrical trading companies in the district, and representatives of some of the principal consumers on the company's mains. A pleasing programme of instrumental and vocal music was ably rendered. Mr. Starr, the general manager of the company, on behalf of the employés, made the presentation to Mr. Pirie. Mr. Starr then called the assembled company to toast Mr. Pirie and the lady who is soon to join him in British Columbia, with Highland honours. Mr. Pirie suitably responded. The only other speech of the evening was a short one by Bailie Willock, convener of the Glasgow Electricity Committee, who spoke of Mr. Pirie's widely known abilities and his popularity, and at the same time gave a short description of his own visit to Canada and British Columbia. Mr. Pirie is taking up the position of audit accountant to the British Columbia Electric Railway Co., at Vancouver.

Mr. Harry B. Matthews, chief lecturer and demonstrator in the Electrical Engineering Section of the Birmingham Municipal Technical School, was recently married to Miss S. E. Ellwood, of Lancaster.

Mr. Ernest R. Canning (of Messrs. W. Canning & Co., Birmingham) was married on 14th inst., and is spending his honeymoon on the Continent.

The *Times* reports that the Home Secretary has appointed Prof. J. E. Petavel, D.Sc., F.R.S., Professor of Engineering in the Victoria University of Manchester, to be an additional member of the Committee on Humidity and Ventilation in Cotton Weaving Factories.

Obituary.—A Central News telegram states that Mr. F. L. Tufts, Professor of Physics at Columbia University, was killed on the 14th inst. while testing some feed wires.

CITY NOTES.

Craigpark Electric Cable Co., Ltd.

The directors' report for the year ending March 31st, 1909, shows a net profit of £6,344, which, with the balance of £683 brought forward, makes the sum of £7,027. The directors now recommend the following appropriations, viz:—Depreciation written off buildings and machinery, £1,000; dividend (already paid) on 37,500 6 per cent. preference shares, for half-year ending September 30th, 1908, £1,125; ditto, for half-year ending March 31st, 1909, £1,125; dividend on 37,500 ordinary shares, at 6 per cent. for the 12 months ending March 31st, 1909, £2,250; reserve account, £500; balance carried forward (subject to payment of directors' fees for the past year), £1,027. There has been a considerable increase in the volume of business in the cable department. Prices of raw material continue low, but there has been a corresponding reduction in the selling prices. Wages have cost more owing to the increased output, and the net result has been a slight reduction in the profits for the year. The golf-ball trade has been very satisfactory, and the directors look forward to another successful season in this department. The stocks have been carefully gone over and certified by the managing director. Mr. Claud Hamilton having resigned from the directorate early in the year, the directors unanimously appointed Dr. Magnus Maclean to fill the vacancy.

Stock Exchange Notices.—The Committee has ordered the undermentioned securities to be quoted in the Official List:—

American Telephone and Telegraph Co.—$50,000,000 additional 4 per cent. convertible bonds, 1936, Nos. 100,001 to 150,000 for $1,000 each.

County of London Electric Supply Co., Ltd.—Further issue of 1,240 6 per cent. cumulative preference shares of £10 each, fully paid, Nos. 133,761 to 135,000.

Application has been made to the Committee to allow the following securities to be quoted in the Official List:—

Great Northern, Piccadilly and Brompton Railway Co.—35,704 4 per cent. guaranteed preference shares of £10 each, fully paid, Nos. 1 to 35,704, in lieu of the ordinary shares now quoted.

Aluminium Corporation, Ltd. (In Liquidation).—A circular has been issued by the joint liquidators, Messrs. R. Lawson and A. H. Gibson, with reference to a recently circulated scheme of arrangement stating that the following gentlemen have been suggested as directors of the proposed new company, and they have expressed their willingness to accept office:—Mr. J. E. Davidson, managing director of the United Alkali Co., Ltd., Newcastle-on-Tyne; Mr. E. Manville, of Messrs. Kincaid, Waller, Manville and Dawson, member of the former board; Mr. Young J. Pentland, of Duncliffe, Murrayfield, Edinburgh, director of the Arizona Copper Co., Ltd.; Mr. Ernest Scott, of Messrs. Ernest Scott & Co., Ltd., engineers, Talbot Court, E.C., and chairman of the Creditors' Committee; Mr. W. C. Stennett, of Messrs. Bott & Stennett, 116, Victoria Street, S.W., who were contractors for the works at Dolgarrog, and are the largest creditors. The circular adds that it is very necessary that the proposed scheme of arrangement should be finally settled at the meetings on Tuesday next.

Merthyr Electric Traction and Lighting Co., Ltd.—The report states that the gross receipts on the light railways for the year amounted to £11,190, and the gross receipts on account of electrical supply to £6,466, making, with £182 sundry receipts, a total of £17,839. After deducting all expenses chargeable to revenue, including £2,056 for debenture interest, and placing £1,000 to the renewals account, there remains a surplus of £4,207, making, with £533 brought forward, £4,740. The payment of the dividend on the preference shares for the 12 months to October 15th, 1908, amounted to £1,500, leaving available for distribution £3,240, which the directors recommend should be applied as follows: Depreciation and reserve account, £1,250; dividend of 5 per cent. on the ordinary shares, £1,500; carried forward, £490.

Monte Video Telephone Co., Ltd.—An interim dividend for the half-year ended January 31st at the rate of 6 per cent. per annum on the ordinary shares is announced.

Federated Malay States Rubber Co.—An interim dividend of 6 per cent. is payable on May 1st, in London, by the Anglo-South American Bank.

Deutsch-Atlantische Telegraphen Gesellschaft.

The report of the directors of the German Atlantic Telegraph Co. for 1908 states that although trade and industry still had to suffer from the unfavourable situation of business in the United States, the Atlantic telegraph traffic of the company only slightly diminished; the traffic on the Vigo cable showed an inconsiderable decline. Large expenses arose from the interruption of one of the Atlantic cables and the Vigo cable by trawlers' nets and owing to other causes. The question of the damaging of submarine cables by trawlers' nets had been the object of a full inquiry by a special commission of the English Government, and would, it was hoped, shortly occupy an international conference. An avoidance of these damages could only be expected by a regulation of trawl net fishing and the control of the gear. The North German Sea Cable Works, of which the company held one-half of the share capital, had been in full operation since the middle of the year on the manufacture of the cable to be laid to South America, and this degree of activity would presumably continue until June, 1910. The cable works proposed to pay 4 per cent. dividend for 1908, although the amount devolving upon the telegraph company was not brought into the accounts for the year. The financial position is as follows for the past two years:—

	1908.	1907.
Share capital	£1,200,000	£1,200,000
Bond capital	955,800	967,000
Gross receipts	228,669	237,470
Expenses and taxes	44,526	43,176
Cable repairs	19,858	938
Cable redemption fund	22,797	22,797
Depreciation provision	5,568	5,148
Net profits	128,923	155,902
Dividend	84,000	84,000
„ per cent.	7	7
Carried forward	22,271	21,209

The net profits diminished by £26,979 in 1908 as compared with the preceding year, and the allocation to the special reserve and cable improvement fund is only £10,000, as contrasted with £35,000 in 1907. On the other hand, the 4 per cent. dividend in the North German Sea Cable Works, if it could have been included in the accounts, would have yielded £6,000 to the telegraph company for the past year.

Calcutta Tramways Co., Ltd.

The ordinary general meeting was held on Tuesday at the offices, 1, Queen Victoria Street, Mr. E. C. Morgan presiding.

The Chairman, in moving the adoption of the report (see Electrical Review, April 16th, page 647), said it would be remembered that at the last meeting it was anticipated that the lines in Howrah would be opened for traffic on May 1st. This, however, unfortunately proved not to be the case. Of the three lines now running, the first was opened on June 10th, the second on July 30th, and the third not till October 20th, so that they practically had had the use of these lines for less than six months. The expenditure on capital had amounted to £60,913 for Calcutta, and £25,663 for Howrah. There would be a further amount of capital expenditure needed for Calcutta to complete the new car-shed, which was now near completion, to erect a shelter for the public at the Esplanade Junction, regarding which they had been for a very long time in negotiation with the Government; but as far as they could see, the total would not exceed £10,000. Turning to the revenue account, there was a small saving in the power expenses, and this would have been considerably greater had it not been for their difficulties with regard to coal and the higher price they had had to pay for their supplies. In the first half of the year it was almost impossible to obtain deliveries of any decent quality of coal. The reasons assigned were the want of trucks on the railways, and a severe outbreak of cholera at the mines, and in order to obtain fuel to keep them going, they had to accept the coal tendered more or less without reference to quality, and they would understand that under these circumstances it was impossible to obtain good results. Fortunately during the latter half of the year conditions of transport became easier, and they were able to exercise greater discrimination, so that their consumption of coal became more normal. Their new contract which came into force on January 1st was at an enhanced price, but as it was a condition that all their coal was to be screened before it was despatched from the collieries, it was hoped that with the reduction in the percentage of dust which would result, they would be able at any rate to keep down the quantity of coal used, to cover the increased price. Considerable reductions had been made in the items of stores used, and maintenance and repairs materials, even after allowing for the extraordinary items of expenditure debited to the latter account last year. This was due to the lessening of the wear and tear on the remaining plant since the new Belliss set had been in operation, and to the whole of the plant working under far more favourable conditions since the new condenser set was put into service in March last. As regarded maintenance and repairs, the principal items of increase were under the heads of track and roadway and cars. The former was due to overhaul of certain of their tracks, and to the increased mileage generally which had to be maintained, the upkeep costs on the Bebala section being exceptionally heavy during the rainy season by reason of the settlement in the macadamised portion of the roadway, the tracks having been laid during the dry season. In the case of the latter, considerable expense was incurred last year in improving the condition of their cars, which had had to be repeated for the year under review. The result of the overhauling had been a marked improvement in the condition and general appearance of the cars, which would, of course, eventually show itself in reduced maintenance charges. Briefly summarising the position, he might say that the year through which they had passed had been one of great difficulty. They had about four miles of new line in Calcutta, which were increasing in productive power, and would, he hoped, soon equal the average of the old Calcutta lines. They had a new car-shed, which would very shortly be fit for use, and they had about five miles of line in Howrah, in addition to a separate and very completely-equipped power station there. It was, perhaps, too early to prophesy regarding Howrah, but there were certain facts which must not be lost sight of. The population, and consequently the need for connection with Calcutta, was increasing. The transit over the bridge seemed to be in sight, and even with the existing disabilities, the number of people who used the trams was increasing, so that they hoped it might not be long before Howrah would be able to bear its own burdens. He was glad to say that their receipts so far this year were good, and promised to be better, as the general state of affairs in India had decidedly improved, and they were now in a position to meet further expansion with comfort and economy.

Sir Henry Kimber, Bart., M.P., in seconding the motion, said that although they were facing a lower dividend, that, he thought, was due to the fact that there had been a number of circumstances against them which he did not think could possibly recur in a single year again, and even if they did not congratulate themselves on getting 4 per cent., they certainly had no reason to feel in any way disheartened. He was a large shareholder in the company, and had never parted with a single share—in fact, he had lately increased his holding. He knew Howrah and Calcutta very well, and believed that given another year or two the extension would not only show a dividend in itself, but would relieve the Calcutta system from having to bear the interest upon the capital raised for the Howrah system.

Mr. Peake asked when further capital expenditure was likely to cease. He pointed out that last year there had been a further issue of 4,333 new preference shares, which had increased the capital by £21,665, while at the same time the receipts were hardly increasing at all.

Mr. Walker remarked that the report was a disappointing one, but that was only to be expected by those who had studied affairs in India. The great trouble they had to meet with was the interminable delays in getting anything through—he supposed that was not in any way due to their officers in India; but he had been wondering whether a local board would be able to expedite matters.

The Chairman, replying on the discussion, said that if they were forced to make further extensions, of course they would have to issue new capital, but, as he had said, as far as they could see at present, their fresh capital expenditure would not exceed £10,000. With regard to the delays, he agreed that they had been inordinate, but it was in no way due to their organisation. They got the Howrah concession seven years ago, and thought they would be able to complete the extension in 12 months; but, as they knew, they had only just got it opened. The fault lay with the Indian officials, who moved very very slowly, and were constantly changing, with the result that very often the negotiations had to be gone over again and again. As to the desirability of appointing a local board, that had been several times considered, but the step was not one which would be in the interests of the company. They had complete confidence in their officials in India, and no delay was ever caused on their side, because, when anything important needed to be dealt with, the telegraph was always used.

The report was adopted.

Electrobus Shares.—According to the *Financial Times*, a firm of brokers is issuing circulars offering London Electrobus shares at the "low price of 13s. 9d. per share net," when the market quotation is 2s. 9d.! A second circular (illustrated) announces loudly that "the ordinary shares receive a minimum preferential dividend of 10 per cent"—how much they have received so far our readers do not need telling.

Western Union Telegraph Co.—The quarterly statement to March 31st last shows that the surplus brought forward at December 31st, 1908, $16,077,905 is increased to $16,597,682 after allowing for interest on debentures and dividends, and including the dividend of 3 per cent., which was payable on 15th inst.

Mexican Telegraph Co.—The accounts to December 31st, 1908, show that the receipts were $811,342, or a decrease of $236,189 as compared with the previous year. Operating expenses amounted to $153,750, an increase of $20,065, leaving the net revenue $657,592. After deducting charges $45,970 and dividends $287,010, there is a credit balance for the year of $324,612, increasing the balance to the credit of profit and loss to $2,706,507.

Switzerland.—The balance-sheet of the Société Franco-Suisse pour l'Industrie Electrique, of Geneva, for the last financial year shows a net profit of £62,442. A dividend at the rate of 3½ per cent. is being declared as compared with only 3 per cent. in the preceding 12 months.

Belgium.—La Société d'Electricité de l'Escaut, of Antwerp, reports a profit of £2,359 for the past financial year.

Melbourne Electric Supply Co., Ltd.

The report of the directors for the year ended August 31st, 1908, shows that during the year capital expenditure in Australia on buildings, plant and mains has been incurred as follows:—On the Melbourne undertaking, £30,645; on the Geelong undertaking, £1,650=£32,295. The profit and loss account shows that the gross profit derived during the year from the Melbourne and Geelong undertakings was £17,677. Adding the dividend received on the company's holding of ordinary shares in the Adelaide Electric Supply Co., Ltd., together with interest, discounts, transfer fees, &c., the total gross profit for the year amounted to £22,030, which compares with £19,741 for the previous year. Management and general expenses at the London head office absorbed £1,983, and interest on debenture stock and sundry loans amounted to £14,758. After payment of these charges, there remains a balance to the credit of profit and loss account of £5,288, to which must be added the amount of £1,594 brought forward, making a total credit balance of £6,882. Of this sum the directors have applied £1,110 in writing off the cost of arranging sundry loans and additional capital, and have transferred £4,000 to reserve account, leaving £1,772 to be carried forward. The progress made by the Melbourne and Geelong undertakings has been as follows:—

	Lighting in 8-c.p. lamps.	Motors in rated h.p.	8-c.p. lamps.	Total units sold.	Gross profit.
Melbourne—					
At August, 1906 ..	57,610	985	89,130	1,336,660	£10,002
,, 1907 ..	76,278	1,553	125,974	1,890,879	£14,290
,, 1908 ..	90,068	2,150	157,412	2,326,807	£16,059
Geelong—					
At August, 1906 ..	17,872	595	36,912	293,843	£1,679
,, 1907 ..	22,150	701	44,582	344,501	£2,064
,, 1908 ..	26,942	818	51,864	312,661	£1,628

With a view to the adjustment of the company's capital account, which has now become a matter of urgency, arrangements have been made, subject to the approval of the existing debenture stockholders and shareholders, to make an issue of a further £100,000 first mortgage debenture stock, and of £100,000 first preference shares on the terms set forth in a circular accompanying the report. The directors strongly recommend the adoption of this proposal, which will have the effect of paying off the company's floating debt and providing further capital for extensions at Melbourne and Geelong of a remunerative character. The Adelaide Electric Supply Co., Ltd., has continued to make satisfactory progress during the year; and a dividend of 3½ per cent. per annum on the ordinary shares was declared in December, 1908, credit for which has been taken in this company's profit and loss account.

Brisbane City Electric Light Co., Ltd.

The directors' report for the half-year ended January 31st, 1909, presented at the meeting held in March, records an output of 976,789 units, as against 853,920 for the corresponding period of 1907, being an increase of 15 per cent. Comparing the revenue from the sale of electricity for the same periods, the increase has been 12½ per cent., while the revenue from all sources has increased 10 per cent. After placing £500 to the credit of the franchise purchase sinking fund account, £150 to the accident insurance account, and a substantial sum to the credit of renewals, replacements and contingencies account, there remains a credit balance of £3,434, which, with the balance brought forward from last half-year, makes a sum of £4,946 disposable. The board recommended that a dividend be paid at the rate of 6 per cent. per annum on all shares, plus a bonus at the rate of 2½ per cent. per annum on the ordinary shares. This absorbs £3,011, leaving £1,935 to be carried forward. Further additions have been made to the plant in Ann Street; a boiler of much larger power has been added, while the switchboard, received earlier in the year, has been erected. The directors trust that no further serious expenditure will be required for additional plant at the Ann Street station, beyond that entailed by the purchase of the new turbine, which was mentioned in the last report. That plant has not yet been delivered by the manufacturers, but the foundations are being laid down in anticipation of its arrival. It is expected that it will be at work in time to cope with the coming autumn load, which in the present instance is expected to be particularly heavy, owing to the rapid increase in the demand for electricity for power purposes, large contracts having been recently secured. Outside of the station good progress has been made with the laying of mains, and electricity is now being supplied to the principal streets of the valley area. During the half-year all the machinery and plant, as well as the underground mains, have worked well, and have been maintained in a state of high efficiency. Owing to the decision of the Government to abandon the resumption proceedings in regard to the company's land in William Street, the plans in connection with the new waterside power station are being prepared. As soon as they are complete a start will be made with the erection of the building and chimney. To provide capital for these works a call has been made on the shares issued in May last.

Telephone Company of Egypt, Ltd.—A dividend of 4 per cent. on both the preferred and deferred shares for the past half-year, making 10 per cent. for the year, is recommended; £500 is placed to reserve for the contemplated pension scheme, and £25,782 is carried forward.

Oriental Telephone and Electric Co., Ltd.

The directors' report for the year ended December 31st last states that, including £1,873 brought forward from December 31st, 1907, and after deducting the interim dividends of 3 per cent. paid November 1st last on both the preference and ordinary shares, and making the necessary provision for redemption of the debenture stock of the company, and other charges as shown in the net revenue account, the amount to be dealt with is £18,729. The directors recommend a final dividend of 3 per cent. (less income-tax) for the year ended December 31st last on the preference shares issued, requiring £1,500; a final dividend of 5 per cent. (free of income-tax) on the ordinary shares issued, making 8 per cent. for the year, absorbing £8,966; transferring to reserve account £2,500, and to reserve for contemplated pension scheme £500, leaving to carry forward £5,263. Notwithstanding the general depression of trade, to which the East was no exception, the directors report an increase of business during the year, owing chiefly to the reconstruction of the systems which has now been completed. The work on the several extensions, referred to last year, has been carried out, and will, it is anticipated, result in a further steady increase of revenue. The Indian local companies have declared the same dividends as for the year 1907—viz., the Bengal Telephone Co., Ltd., 5 per cent., and the Bombay Telephone Co., Ltd., 6 per cent., and the amounts have been included in the revenue account. Both these companies report an increased accession of subscribers, but the increased revenue is required to assist capital expenditure for some time to come. The Telephone Co. of Egypt, Ltd., has declared a dividend of 10 per cent. for the year on both its preferred and deferred shares, which has also been brought into the account. In spite of the acute financial conditions which continue to prevail in Egypt, the revenue for the past year shows a fair increase over that of 1907. The China and Japan Telephone and Electric Co., Ltd., continues to make satisfactory progress both at Hong Kong and Kowloon, and the directors of that company consider the outlook favourable. As foreshadowed in the last report, that company declared a dividend of 5 per cent. for the year 1907, which has also been included in the revenue account, and it anticipates continuing to pay dividends henceforward. Mr. C. P. Ackers has been elected to the board to fill the vacancy caused by the death of Sir Auckland Colvin.

Babcock & Wilcox, Ltd.

The directors' report for the year ended December, 1908, shows a net profit of £301,615, plus £38,664 brought forward, making a balance of £340,279. After deducting the interim dividends paid October 9th, 1908, of 3 per cent. on the preference shares and of 8 per cent. on the ordinary shares, amounting to £69,400, £270,879 remained, from which the directors recommend that the following dividends be paid for the half-year ending December 31st, 1908, viz.:—3 per cent. on the preference shares (from which income-tax is to be deducted), £3,000; dividend of 8 per cent. on the ordinary shares (free of income-tax), £66,400; bonus of 4 per cent. on the ordinary shares (free of income-tax), £33,200; placing to the reserve fund £100,000, and to the dividend equalisation fund £25,000; leaving to be carried forward £43,279. Although, in common with all other engineering firms, this company is affected by the general depression in trade, the works are fairly well occupied. The works, buildings, machinery and plant have been well maintained, and additions and improvements carried out.

Prospectus.—*Bernam-Perak Rubber Plantations, Ltd.*—This new company, which acquires 1,547 acres of rubber land in Perak, has been offering 27,500 6 per cent. cumulative preference participating preference shares of £1 each for subscription.

British Columbia Electric Railway Co., Ltd.—The directors announce an interim dividend at the rate of 8 per cent. per annum on the deferred ordinary stock for the half-year ended December 31st, 1908.

American Telephone and Telegraph Co.—A financial daily says that the net earnings for the three months ended March 31st, after payment of interest charges and April dividends, amounted to $1,464,000, as compared with $1,518,000 for the corresponding period of last year.

Havana Electric Railway Co.—The report states that the gross earnings of the railway and stage properties of the company were $2,276,807, an increase of $133,684 compared with 1907. The directors have during the year declared and paid dividends aggregating 6 per cent. on the preferred, and 1 per cent. on the common stock.

Isle of Wight Electric Light and Power Co., Ltd.—The report for 1908 shows an available balance, including £190 brought forward, of £11,391. The directors recommend the payment of the preference dividend and the transfer of £2,500 to renewal fund, and £1,000 to the reserve fund, leaving £294 to be carried forward.

Montreal Light, Heat and Power Co.—The directors announce a dividend of 1½ per cent. on the paid up capital stock, being at the rate of 6 per cent. per annum for the quarter ending April 30th.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	April 14	2,669	+ 172	46	62,119	— 90	..	..
Ayr	,, 17	517	+ 59	48	13,746	— 283	8	..
Bath	,, 14	1,728	+ 432	15	9,808	+ 604	..	..
Belfast	,, 16	8,063	+ 925	..	9,112	+ 956	37	..
Birkenhead	,, 18	2,137	+ 109	..	2,702	..	18·52	..
Birmingham Corp.	,, 10	13,209	+ 550	52	333,362	+ 8,464	..	..
Blackpool-Fleetw'd	,, 17	1,588	+ 717	15	4,780	+ 978	..	..
Bolton	,, 18	5,553	— 310	3	6,898	— 5	26	..
Bournemouth	,, 14	3,932	+ 719	..	..	..	21·96	..
†Bradford	,, 10	5,014	+ 738	2	7,186	+ 199	54·9	..
Brighton	,, 18	2,126	+ 410	3	2,675	+ 404	9·5	..
Bristol	,, 16	12,110	+ 2,750	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	,, 9	411	— 16	14	2,975	— 73	3·65	..
Barnsley	,, 9	348	— 4	,,	2,260	— 34	..	..
Barrow	,, 9	466	+ 12	,,	2,817	— 180	5·37	..
Cavehill	,, 9	117	— 11	,,	765	— 53	..	..
Devonport	,, 9	756	— 122	,,	5,191	— 663	8·85	..
Gateshead	,, 9	2,028	+ 47	,,	13,572	— 104	11·25	..
Gravesend	,, 9	377	— 14	,,	2,446	— 158	6·5	..
Greenock	,, 9	1,033	+ 57	,,	6,250	— 214	7·25	..
Hartlepool	,, 9	456	+ 65	,,	2,747	— 173	6·72	..
Kidderminster	,, 9	173	..	,,	1,109	— 59	..	..
Leamington	,, 9	336	+ 37	,,	1,974	+ 147	..	..
Merthyr	,, 9	444	+ 29	,,	2,758	+ 29	2·9	..
Metropolitan	,, 9	12,505	+ 2,309	,,	74,462	+ 8,026	22	..
Middleton	,, 9	728	+ 76	,,	4,107	— 116	8·5	..
Mid. Joint Com'tee	,, 9	11,267	— 7	,,	73,269	— 2,473	..	..
Oldham—Ashton	,, 9	1,226	+ 67	,,	7,376	— 426	9·13	..
Peterborough	,, 9	251	+ 32	,,	1,355	— 96	5·31	..
Potteries	,, 9	3 632	— 16	,,	21,148	— 1,056	29	..
Rothesay	,, 9	142	+ 30	,,	677	+ 1	2·75	..
Southport	,, 9	510	+ 34	,,	3,054	+ 120	8·17	..
S. Metropolitan	,, 9	1,630	— 236	,,	9,200	+ 129	..	..
Swansea	,, 9	1,823	+ 3	,,	12,031	+ 295	12·5	..
Tynemouth	,, 9	340	+ 50	,,	1,852	— 90	3·75	..
Weston-s-Mare	,, 9	92	+ 31	,,	382	+ 28	3	..
‡Worcester	,, 9	531	+ 36	,,	3,223	— 25	5·75	..
Wrexham	,, 9	214	+ 5	,,	1,242	— 14	..	..
Yorks. Wool. Dist.	,, 9	1,781	— 72	,,	11,576	— 369	17	..
Miscellaneous	,, 9	391	+ 25	,,	2,500	— 13	..	..
Burnley	,, 17	2,944	+ 125	..	..	..	..	..
Burton-on-Trent	,, 18	562	+ 50	3	709	+ 7	10	..
Bury	,, 18	2,784	+ 161	2½	3,444	— 25	22·5	..
†Cardiff	,, 3	2,016	+ 3	..	..	..	..	..
Carlisle	,, 17	370	+ 86	15	2,249	— 7	..	..
Chatham and Dist.	,, 15	2,002	+ 700	15	10,755	+ 1,510	14·98	2·77
Cork	,, 15	1,662	+ 98	15	6,262	+ 274	..	..
Croydon	,, 9	3,056	+ 461	..	..	..	11·25	·75
†Darlington	,, 3	183	— 11	..	..	..	..	..
Darwen	,, 16	586	+ 86	..	..	..	4·96	..
Dover	,, 10	309	+ 30	52	10,599	— 454	4·75	..
Dublin	,, 16	10,678	+ 1,065	..	73,104	+ 774	54·25	..
Dundee	,, 14	2,423	+ 191	47⅞	56,661	+ 2,148	15	..
East Ham	,, 17	2,121	+ 411	2½	2,552	+ 514	8·43	·68
Exeter	,, 16	723	+ 190	3	810	+ 160	5·5	..
Glasgow	,, 17	35,081	— 883	..	778,115	— 16,907	90·5	1·5
Hastings	,, 15	2,507	+ 857	..	..	..	..	..
Huddersfield	..	..	..	..	..	..	..	..
Hull	,, 17	5,281	+ 495	..	6,503	+ 72	18	..
Ilkeston	,, 14	300	+ 10	..	..	..	..	..
†Ipswich	,, 17	848	+ 143	3	1,003	+ 167	10·5	..
Kilmarnock	,, 10	274	— 12	47	6,991	— 351	4·25	..
Lan'kshire Trm. Co.	,, 18	2,451	— 71	15	17,735	— 1,037	17	1·18
Lancashire United	,, 15	2,484	+ 1,100	15	18,499	+ 1,192	..	..
Leeds	,, 10	6,109	+ 763	..	..	..	96·75	·25
Leicester	,, 17	4,854	+ 609	..	..	..	..	..
†Leith	,, 10	509	+ 15	47⅞	24,376	+ 16	6	..
Liverpool	,, 10	21,464	+ 141	14½	147,384	— 648	104	..
††L.C.C.	Mar. 27	33,796	+ 2,771	..	1,783,267	+ 183,86	121	4·25
London United	April 17	18,825	+ 1,756	..	78,350	— 3,032	..	..
Manchester	,, 10	28,555	+ 3,300	..	..	..	90·5	6
Newcastle	,, 17	8,408	+ 814	..	10,924	+ 335	..	..
Newport	,, 10	1,345	+ 110	..	..	..	14·5	..
Oldham	,, 18	4,298	+ 240	3	7,213	— 190	23·75	..
Pontypridd	,, 10	670	+ 95	52	19,808	+ 5,204	5·5	1·75
Portsmouth	..	..	..	..	..	..	14·5	..
Preston	,, 14	1,562	+ 222	..	..	..	..	..
Rotherham	,, 15	1,351	+ 180	2½	1,414	+ 126	10	·66
Salford	,, 12	8,631	— 1,249	..	..	..	..	..
Sheffield	,, 18	11,501	+ 544	3⅔	19,375	— 63	37	1·25
Southampton	,, 14	2,156	+ 336	..	..	..	..	..
Southend-on-Sea	,, 14	1,006	+ 385	..	..	..	..	..
South Shields	,, 10	1,102	+ 100	..	..	..	..	..
Swindon	..	..	..	..	..	..	..	..
Tyneside	,, 14	1,226	+ 548	15	6,008	+ 762	..	..
Wallasey	,, 10	1,805	+ 261	..	..	..	..	·22
Walthamstow	,, 17	1,559	+ 370	3	1,817	+ 447	9	..
†West Ham	,, 8	2,233	+ 183	52	114,944	— 4,952	15	·3
Wolverhampton	,, 14	1,803	— 260	..	..	..	..	..
Baker St.-Waterloo	,, 17	6,110	+ 410	15	50,730	+ 4,995	4·25	..
Cen. London Rly.	,, 17	9,203	— 1,705	15	83,482	— 7,720	..	..
Char. +, Eus. Hamp.	,, 17	7,880	+ 1,490	15	57,545	+ 10,315	7.75	..
City & S. Lon. Rly.	,, 18	5,914	+ 79	15	50,050	+ 682	7·8	..
Dublin-Lucan Rly.	,, 16	295	+ 59	15	1,682	+ 177	7	..
G.N. and City Rly.	,, 17	2.776	— 431	15	28,394	— 2,905	3·5	..
G.N., P'y. & Brmn.	,, 17	10.460	+ 75	15	87,155	+ 6,280	9·25	..
L'pool Overh'd Rly.	,, 18	2,750	+ 64	15	20,666	— 1,350	6·8	4·3
Mersey Railway	,, 10	4,005	+ 1	14	27,328	+ 624	4·5	..
Metropolitan Rly.	,, 18	30,513	+ 841	15	235,172	+ 6,964	24·5	..
Met. District Rly.	,, 17	18,200	+ 1,489	15	145,443	+ 12,092	24	..
Anglo-Argentine	,, 15	81,980	+ 3,572	15	595,647	+ 36,511	..	..
§Auckland	Mar. 26	13,656	+ 2,444	12	41,824	+ 4,724	..	..
Bombay (B.E.T.)	,, 18	5,238	+ 595	11	28,188	+ 2,142	..	..
§Brisbane	March	16,000	+ 1,510	12	45,330	+ 3,110	..	..
Calcutta	April 17	6,086	— 99	..	..	..	..	..
§CapeElectricT.Ld.	March	13,179	..	..	..	..	..	..
§Kalgoorlie, W.A.	,,	4,183	..	12	11,306	..	20·5	..
Madras	April 15	1.487	+ 163	15	9,177	+ 162	..	..
Perth (W.A.)	,, 16	2,954	+ 106	15	22,462	+ 265	28	2·4

* Compared with the corresponding period of 1908. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

After experiencing a sharp setback in all departments, the Stock Exchange markets again moved forward when the news from Turkey gave promise of a peaceable solution to the latest Near Eastern problem being reached. The foreign political situation once more dominates the financial sky, and the Young Turk is the primary person of the moment.

Electricity prices are mostly good. There is a fair investment demand for the supply companies' shares. Telegraph issues are firm, and better prices are quoted in several cases for manufacturing stocks and shares.

Home Railway descriptions gave way sharply on a drop in Consols, but had no difficulty in recovering when the general sentiment changed. Central Londons have maintained their rise, though City and South London shaded off a trifle. Great Northern and City Preferred rose 2s. 6d. to 7s. 6d. middle. Both Metropolitans and Districts are a little lower. The Underground Electric Railway varieties show no change.

Electric railway and tramway concerns abroad are in favour. British Columbia Preference stock and First Debentures have hardened. Anglo-Argentine Tramway 10 per cent. Preference are a further $\frac{1}{16}$ to the good. The Mexican-Canadian group, however, still suffer from the effect of the slump, precipitated by Turkish affairs, in general markets. Mexico Tramways Common stock came down 3, but the bonds held their rise to 94½. Rio Tramways bonds are the same price, and the shares stand at 101½. Mexican Light and Power Common declined 1½, allowing for the dividend of a dollar. Shawinigan at 96, *ex* 1, is ½ lower. On the other hand, Canadian General Common and Preference have both advanced, to 116½ and 117 respectively. Electrical Development of Ontario 5 per cent. bonds are 3 up.

The growing inquiry for investments continues to assert its influence amongst electricity supply shares. Rises have taken place in Bromptons, Charing Cross Preference, Chelsea, City of London, County Ordinary and Preference, Metropolitan Preference, St. James's, and Westminster Preference, the advances ranging from ⅛ to ¼. Nor can the movement be explained by any reason other than demand by the public for sound shares yielding a fair rate of dividend. Smithfield shares have risen from 10s. 8d. to 13s. 9d., South Londons from $2\frac{9}{16}$ to $2\frac{13}{16}$, and Urbans are marked up. Victoria Falls Power Preference have been reduced to 17s. 6d. It is of interest to observe how the present strength of Kaffir shares is declared to be due in part to the prospect of a substantial reduction of working costs on the Rand when the South African mines begin to get power in bulk from the Falls!

The River Plate Electricity Company has, to-day, Tuesday, received confirmation of the powers taken to increase the capital by the creation of 50,000 new Preference shares of £1 each, ranking, *pari passu*, with those Preference already existing.

Telegraph stocks and shares display decided firmness, although prices have not varied to any great extent. The principal movement is a rise of 2½ in Eastern Telegraph Ordinary, which was reflected by the more modest improvement of ⅛ in Eastern Extensions. Western Telegraphs are still rising. West Coast of American shares slightly receded, and business has been done in them this week at 9s. Globe Telegraph and Trust Ordinary jumped up 7s. 6d. to 10⅞ upon a persistent demand for small lots of shares. The Preference remain at 13½. Anglo-American Telegraph Ordinary and Preferred are *ex* dividend, and the latter stock has hardened. Amongst the telephone issues, National Third Preference are once more popular, the price gaining $\frac{1}{16}$. American Telephone and Telegraph capital stock rose ½, and Monte Video Ordinary moved up a little upon the declaration of the same interim dividend as before.

From the nominal quotation of 58½, Brush 4½ per cent. perpetual Debenture stock was marked down to 45, while the price of the Second Debenture stock dropped 4. One or two sellers, and no buyers, is the cause for the decline. India-Rubber, Gutta-Percha shares are 10s. down. Rubber shares, however, are a very strong market, and for all the principal shares there is a good demand. Willans & Robinson Preference are 5s. better, and the 4 per cent. First Mortgage Debenture stock has been lifted to 77½ middle, one transaction being officially recorded at 80. Babcock & Wilcox rose $\frac{1}{16}$, so did Castner-Kellner shares. Vickers and other armament descriptions are another good market, being aided by rumours current in the City last week that the Government are about to issue a large Navy Loan.

The annual report and accounts of the Stock Exchange, as a company, show that the working expenses of electric power amounted for the year to £1,928 2s. 3d., while the maintenance charges are £31 3s. 11d., a bagatelle compared with the £656 spent on maintenance in the preceding 12 months. Some of the shareholders complain greatly of the cost of running the private installation, and want to have the business of supply handed over to one of the City companies. But the managers decline to make any alteration.

SHARE LIST OF ELECTRICAL COMPAN ES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations April 13th.	Closing Quotations April 20th.	Business done week ended April 20th, 1909. Highest.	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	2⅜ — 3¼	2⅜ — 3¼	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,350 Red.	100	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 6 5
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½ %	8 %	8 %	..	139½ —140½	140 —141	140⅜	..	+ ⅛	5 13 6
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 0 0
598,180	Anglo-American Telegraph	Stock	3½%	3½%	3½%	£3 4s.	55 — 58	55 — 58 xd	..	..	..	5 5 3
3,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	100 —102	99½ —101½xd	101⅞	100½	..	5 18 3
3,200,910	Do. do. do. Deferred	Stock	½%	12½%	1 %	8/-	14⅛ — 14⅜	14⅛ — 14⅜	14 1/16	14⅛	+ ⅛	2 12 4
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	98 —100	98 —100	..	..	..	5 0 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	4 15 6
2,431,350	Commercial Cable Stlng. 500 year 4 % Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	86 — 88	87½ — 89½	88⅛	86⅜	+1½	4 9 5
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	7⅜ — 8⅜	7⅛ — 8⅛xd	..	..	..	7 1 2
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	17 — 18	17 — 18	..	..	..	5 11 1
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3½	3 — 3¼	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8¼ — 9¼	8¼ — 9¼	..	..	..	5 8 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	8 16 6
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12¼ — 12⅝	12¼ — 12⅝	12⅛	12 7/16	..	6 9 3
48,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	129½ —132½	133 —136	134⅛	130	+3½	5 2 11
2,000,000	Do. 5% Pref. Stock..	100	5%	5%	5%	..	85 — 87	85 — 87	86⅛	86	..	4 0 6
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	104 —106	104 —106	..	..	..	3 15 6
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	..	11⅞ — 12⅛	12 — 12⅛	12 1/16	12 1/16	+ ⅛	5 12 0
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
200,000	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	101 —103	101 —103	101½	..	+1	3 17 6
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	..	10½ — 10⅝	10⅝ — 11⅛	10⅞	10⅜	+ ⅜	5 3 11
181,127	Do. do. 6 % Pref...	10	6 %	6 %	6 %	..	12¼ — 12⅜	12¼ — 13½	13	12⅜	— ⅛	4 10 7
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	18%	29 — 31	29 — 31	..	..	..	5 16 2
14,800	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	52 — 55	52 — 55	54	53⅛	..	6 18 11
$41,380,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	72 — 77	72 — 77	..	..	..	5 3 11
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	71 — 76	71 — 76	..	..	..	5 5 3
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	3/16 — 7/16	3/16 — 7/16	17/-	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	3/4 — 15/16	3/4 — 1	..	..	+1/32	6 0 0
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	13/16 — 7/8	13/16 — 7/8	..	..	..	5 12 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	106 —108	106 —108	107½	107	..	5 11 1
3,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	120½—122½	120½—122½	122⅝	120⅝	..	4 18 0
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5 5/16 — 5 7/16	5 5/16	..	+ 3/16	4 6 0
2,000,000	Do. do. 8½ % Deb. Stock Red. ..	Stock	8½%	8½%	8½%	8½%	98 —100	98 —100	98⅛	98	..	8 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	101	100⅛	..	3 18 5
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	1 5/16 — 1 7/16	1 5/16 — 1 7/16	..	..	..	5 17 3
50,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	..	1⅛ — 1¼	1⅛ — 1¼	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	..	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889	Reuter's	8	5 %	5 %	5 %	..	7½ — 8½	7½ — 8½	..	..	..	4 17 7
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
3,088	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	127	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6⅜ — 7	6⅜ — 7⅛	7	6⅜	..	5 13 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4⅞ — 5⅛	5 — 5⅛	5⅛	..	+ ⅛	4 10 11
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 58,008	2½	Nil	2½%	2½%	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	3 16 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	18 — 12½	13⅛ — 13⅜	13 5/16	12⅜	+ ⅛	5 1 10
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	3/8 — 7/16	7/16 — 1/2	9/-	..	—1/32	Nil
34,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	7/8 — 15/16	7/8 — 15/16	8⅛	..	..	7 3 3
4,869	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7⅛ — 8⅛	7⅛ — 8⅛	..	..	..	2 14 1
80,000	Do. do. 5 % Debs., Nos. 1 to 1,600	100	5 %	5 %	5 %	5 %	100 —102	101 —103	..	..	+ 1	4 17 1

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	9 %	10 %	9 — 9¼	9 1/16 — 9 5/16	9¼	9 1/16	+1/16	5 6 8
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	6⅜%	6 %	6 1/16 — 6 5/16	6 3/16 — 6 5/16	6⅜	6¼	..	4 15 10
978,280	Do. 4 % Deb. Stock	..	..	..	..	..	..	91 — 93	91½	91¼	..	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	4 16 2
880,000	Babcock & Wilcox, 1 to 580,000..	1	20 %	20 %	20 %	..	4⅛ — 4¼	4 3/16 — 4 5/16	85/-	83/6	..	4 14 1
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 3/16 — 1 5/16	1 3/16 — 1 5/16	..	..	..	3 13 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	20 0 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	2⅛ — 2⅜	2⅛ — 2⅜	55/-	53/9	..	11 4 0
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3¾ — 4	3¾ — 4	..	..	..	7 10 0
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3¾ — 4¼	3¾ — 4¼	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	95 —100	95 —100	..	..	..	5 10 0
500,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	6 %	8 %	8 %	142 —146	142 —146	141½	..	..	5 9 7
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	121 —125	122 —126	122½	122¼	+1	4 15 3
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	107 —109	107½ —109½	109	108¾	+ ½	4 11 4
288,000	Do. 4½ % 1st Mort. Debs., 1 to 6,350 ..	40	4½%	4½%	4½%	4½%	102¼—104¼	101 —103 xd	..	..	..	10 16 3
280,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
188,801	British Electric Traction	10	3 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	15/9	7/6	—1/9	Nil
161,427	Do. do. 6 % Cum. Pref.	10	6 %	6 %	8 %	..	2 1/16 — 2 1/8	2 1/16 — 2 1/8	51/3	45/-	+ ⅓	13 6 8
1,478,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	84 — 88	84 — 88	86½	85⅛	..	5 13 8
628,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	68 — 73	66 — 71 xd	..	..	..	6 6 9
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	10 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	6 13 4
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6¼	6⅛ — 6⅜	..	..	+ ⅛	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	104 —107	105 —108	..	..	+1	4 3 4
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 18 11
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
1,916,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	38 — 43	38 — 43	..	..	..	9 6 0
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	9/16 — 11/16	9/16 — 11/16	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	9½%	Nil	Nil	..	0 — ¼	0 — ¼	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	..	0 — ¼	0 — ¼	..	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	56 — 61	40 — 50	..	..	—7½	9 0 0
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	33 — 38	24 — 33	..	..	—4½	13 12 8
127,610	Calcutta Trams, 1 to 127,610	5	8 %	8 %	6 %	..	4⅛ — 5	4⅛ — 4⅜	90/-	88/9	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	5 %	4⅛ — 5⅛	4 1/16 — 5⅛	..	..	..	4 18 0
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9⅛ — 10⅛	9⅛ — 10⅛	..	..	..	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	..	..	..	4 4
491,223	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅛ — 1⅜	1 1/16 — 1 1/8	34/9	34/6	+1/16	6 16 11
210,158	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	103 —107	102 —106	103	..	—1	4 4 11
1,893,510	Central London Railway, Ord. Stock..	Stock	4 %	4 %	3 %	3½%	65 — 67	65 — 67	..	..	..	4 17 0
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	83 — 85	83 — 85	..	..	..	4 14 2
553,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	49 — 51	49 — 51	50⅜	50½	..	4 14 2
1,480,000	City and South London Railway	Stock	1⅞%	3½%	3½%	1½%	31 — 32	30¼ — 31½	31⅜	..	— ⅛	4 15 3
85,000	Crompton & Co., Nos. 1 to 85,000	5	2½%	5 %	5 %	5 %	1 — 1½	1 — 1½	..	..	..	9 7 6
100,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	— 98	95 — 98	..	..	..	5 2 0

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(Continued.)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(Continued)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1906.	1907.	1908.	Closing Quotations Apr. 13th.	Closing Quotations Apr. 20th.	Business done week ended Apr. 20th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	23/6	..	..	8 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 3/32 — 1 5/32	1 3/32 — 1 5/32	..	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6 %	6 %	6 %	11¼ — 12¼	11¼ — 12¼	..	..	..	4 16 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½	12½ — 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	8	4½%	4½%	4½%	..	1/32 — 1/16	1/32 — 1/16	..	..	..	20 0 0
17,139	Do. "A" shares, 01—017,139	5	4½%	4½%	4½%	..	1/32 — 1/16	1/32 — 1/16	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	1¾ — 2¼	1¾ — 2¼	..	..	..	8 6 9
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	73 — 78	75 — 78	..	..	..	6 2 7
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	84 — 87	84 — 87 xd	85½	..	..	6 12 4
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	7 %	½ — ¾	½ — ¾	6/-	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	1 — 1⅛	1 — 1⅛	22/6	..	..	11 4 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	7¼ — 7¾	7¼ — 7¾	..	..	..	6 9 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	3½	Nil	83 — 87	83 — 87	..	..	..	4 12 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	¾ — ⅞	¾ — ⅞	..	..	..	3 6 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	10½ — 10¾	10½ — 10¾	..	..	..	6 10 3
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	102 —103	102 —103½	..	..	..	4 16 10
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	11½ — 12½	11½ — 12½	..	..	..	6 0 0
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	⅝ — ¾	⅝ — ¾	..	..	..	4 1 10
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10%	10 %	10 %	..	106 —108	106 —108	..	..	..	4 3 4
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½%	Nil	15 — 16	14½ — 15½	15	14½	— ½	6 5 0
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	1 — 1 1/16	⅛ — 1	..	..	— 1/16	Nil
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	Nil	4½ — 5½	4½ — 5½	..	..	..	9 10 6
899,980	Do. do. 60,008 to 100,000	10	3 %	3 %	3 %	Nil	2 — 3	2 — 3	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	3½%	3¼ — 4	3¼ — 4	..	..	..	4 8 11
1,831,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	3 — 4	3 — 4	..	..	..	9 7 6
5,782,062	Metropolitan Consolidated	100	2½%	1 ¼%	¼%	¼%	69 — 74	70 — 75	71½	71	+1	5 6 8
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½%	86 — 87	35½ — 36½	36½	35 15/16	— ½	1 7 5
3,295,000	Do. District	100	Nil	Nil	Nil	Nil	69 — 71	69 — 71	70	69¾	..	3 17 6
391,397	Metropolitan Electric Trams., Ord.	1	..	..	..	4½%	14½ — 15	14½ — 14⅝	15	14⅜	..	Nil
314,016	Do. do. Defd.	1	Nil	Nil	Nil	Nil	⅜ — ½ xd	⅜ — ½ xd	..	..	..	..
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/16 — ⅛	1/16 — ⅛	1/-	..	..	Nil
600,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	15/16 — 1	15/16 — 1	15/6	..	..	5 19 5
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	93 — 96	95 — 97	..	..	+1½	4 12 9
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	141½—143½	138½—140½	142½	139½	—3½	..
245,500	Potteries E. Trc.	1	4 %	4 %	4 %	4 %	93½ — 94½	93½ — 94½	94⅜	94½	..	5 5 6
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅛ — ¼	⅛ — ¼	..	..	..	8 0 0
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	¼ — ⅜	¼ — ⅜	..	..	..	6 17 11
87,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	88 — 91	89 — 91	90½	90	..	4 18 11
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	82 — 84	82 — 84	33½	32½	..	5 14 10
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	100 —102	100 —102	..	..	..	3 18 5
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	102 —103	102½—103½	103½	103	..	..
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	84 — 86	84 — 86	..	..	..	5 4 8
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	1	Nil	Nil	10 %	Nil	84 — 86	84 — 86	..	..	..	..
66,666	Do. 6 % C.P., 80,001 to 80,000 & 125,001 to 141,666	5	Nil	..	6 %	6 %	⅜ — ½	⅜ — ½	15/-	..	..	10 0 0
246,404	Do. 4 % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	2 — 2½	2½ — 3	55/-	53/9	+ ⅛	10 0 0
							68 — 72	69 — 73	80	..	..	5 9 7

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000		5½%	5½%	5½%	5½%	4⅜ — 5	4⅜ — 4⅝ xd	..	..	..	5 10 0
76,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
30,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	8¼ — 8⅝	8⅜ — 9	8⅝	..	+ ⅛	5 11 1
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8 — 8¼	8 — 8¼	..	..	..	4 2 4
886,976	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 — 102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3⅜ — 4⅛	3⅜ — 4⅛	..	..	..	5 17 8
80,000	Do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 — 4⅛	4⅛ — 4⅛	88/0	..	+ ⅛	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Pri.	5	4½%	4½%	4½%	4½%	3⅝ — 4⅛	3⅝ — 4⅛	80/-	..	+ ⅛	5 5 11
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 98	96 — 98	97⅜	..	..	4 1 8
49,496	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	4½%	3⅝ — 3¾	3¾ — 4	76/8	75/-	+ ⅛	5 12 6
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10½ — 10⅝	10⅝ — 10⅞	10⅝	10½	+ ⅛	5 11 8
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11⅜ — 12⅛	11⅜ — 12⅛	11⅜	10 15/16	..	4 16 0
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —123	121 —123	..	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅜ — 2½	2⅜ — 2½	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	3¼ — 3⅜	3¼ — 3⅜	..	..	..	6 13 4
250,000	Do. do. do. 5 % 1st Mtg. Deb. Stock	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	5 2 0
40,000	County of London Electric Lighting, Ord. i—40,000	10	6 %	5 %	5 %	5 %	8¼ — 8⅝	8⅜ — 8⅞	..	..	+ ⅛	5 14 3
50,997	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10½ — 11	10⅝ — 11⅛	10⅝	10⅝	+ ⅛	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	108½	..	..	4 2 7
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	101 —104	101 —104	102⅛	..	..	4 6 7
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	⅛ — 3/16	⅛ — 3/16	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	8 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	59 — 62	59 — 62	60½	..	..	7 0 8
$8,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	..	5 %	85 — 87	85 — 87	86⅞	..	..	5 14 11
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4¼ — 5	4¼ — 5	..	..	..	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	5 — 5¼	5 — 5¼	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	8½%	7⅛ — 7⅜	7⅛ — 7⅜	..	..	..	5 9 8
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	99 —101	99 —101	99⅜	..	..	4 19 0
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	8 %	7¼ — 7⅜	7¼ — 7⅜	..	..	..	6 1 8
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 96	93 — 96	..	..	..	4 0 0
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	3 %	1⅝ — 2¼	1⅝ — 2¼	41/3	..	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	5 — 5⅛	5 — 5⅛	5 1/16	5 1/16	..	5 11 8
374,896	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	92 — 96	92 — 96	..	..	..	4 3 4
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4⅜ — 5⅛	4⅜ — 5⅛	95/-	..	..	4 17 7
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜ — 5⅛	4⅜ — 5⅛	..	..	+ ⅛	4 5 9
220,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	..	..	..	4 2 7
248,000	Do. 3½ % Mort. Deben. Stock Redeem.	Stock	3½%	3½%	3½%	3½%	85 — 88	85 — 88	87	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	87½ — 88½	87 — 88	88½	87½	— ½	5 13 8
18,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½%	78 — 80	75½ — 77½ xd	78	76	..	4 7 6
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	110 —112	110 —112	111½	111	..	6 5 0
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	91½ — 92½	91 — 92	92⅜	91½	— ⅜	5 8 8
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 98	95 — 98	96	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	2½%	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	8 12 6
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5 — 5⅛	4⅞ — 5⅛	..	..	— ⅛	4 16 3
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	100 —102	98 — 100 xd	..	..	..	..
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	11 — 12	11 — 12	..	..	..	5 16 8
20,000	Oxford, 1 to 96 and 407 to 20,810	5	7 %	7 %	7 %	..	6 — 6¼	6 — 6¼	6¼	6 1/32	..	6 7 8
60,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	6 %	8 %	1⅛ — 1⅛	1¼ — 1⅜ xd	27/9	26/6	..	5 16 4
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	6 %	1⅛ — 1⅛	1 — 1⅛ xd	..	..	..	5 6 8
194,684	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	101 —104	101 —104	..	..	..	4 16 2
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8¾ — 9⅛	9 — 9⅛	9⅛	..	+ ⅛	5 5 2
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	7 — 7⅛	7 — 7⅛	..	..	..	4 13 4
150,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	Nil	⅝ — ¾	⅝ — ¾	..	..	+ 1/16	Nil
46,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	68 — 70	68 — 70	..	..	..	5 11 1
65,000	South London Electric Supply, Ord.	4	4 %	3 %	4 %	5 %	2⅜ — 2⅝	2⅝ — 3	56/3	53/9	+ ⅛	6 13 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	⅜ — ½	⅜ — ½	..	..	..	4 0 0
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	5 9 10
220,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 5 9
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	½ — 1	⅝ — 1	..	..	+ ⅛	90 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1½ — 2	1½ — 2⅛	..	..	+ ⅛	11 2 2
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	78 — 82	79 — 83	82	..	+1	5 8 5
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	..	⅝ — 1	⅝ — ¾	18/-	16/10½	— 3/32	..
110,000	Westminster Electric Supply, Ord.	5	13 %	12 %	10 %	10 %	9⅜ — 9⅝	9⅜ — 9⅝	9⅝	9 7/8	..	5 1 3
21,979	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5¼ — 5⅜	5⅜ — 5⅝	..	..	+ ⅛	4 0 0

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank ate of Discount 2½ per cent., April 1st, 1909.

PROCEEDINGS OF INSTITUTIONS.

Faraday Society.

A New Electrical Hardening Furnace.

This interesting furnace, worked by electricity, which was described to the Faraday Society at the meeting held on March 30th by Messrs. E. Saberaky and E. Adler, is mainly intended for hardening steels, and it shows signs of carefully thought-out design for the purpose in view. The furnace works on the "resistance" principle, consisting in essentials of a bath of molten salts, to which the current is led by means of pure iron electrodes, and in which the articles to be treated are immersed. The constitution of the bath depends on the temperature required. The following table shows what salts or mixtures are recommended for the various purposes specified:—

Process.	*Temp. °C.*	*Salts.*
Tempering steel ...	200—580	Sodium and potassium nitrates.
Annealing copper alloys	650—900	Sodium chloride alone or with potassium chloride.
Hardening carbon steels	750—1,100	Potassium and barium chloride.
Hardening compound steels	1,050—1,350	Barium chloride.
	1,500—1,600	Calcium or magnesium fluoride.

Seeing that one of the advantages of such a furnace is the protection afforded against the oxidation by the atmosphere of the metal under treatment, one would think that nitrates would not be altogether satisfactory to use; however, the chlorides have been found not to have any deleterious effects on the steels, while the chlorine evolved from them is negligibly small in quantity. A hood over the furnace removes what gas is evolved. The fluorides have not been experimented with on a commercial scale; one would imagine that difficulties would arise with these salts, but only experience can decide such a point. Of course, an alternating current has to be used, to prevent electrolysis of the salts; a periodicity of 25 is found sufficient to prevent this occurring to any notable extent.

All the above salts are, like the Nernst filament, conductors only when they are hot, and therefore an auxiliary electrode is used for starting up the furnace. This is simply a piece of arc carbon fitted into an iron stick, which is connected to one electrode and pressed momentarily against the other. The heat generated melts the salt in the immediate vicinity of the carbon rod, and this is then drawn slowly across the bath, leaving a trail of liquid salt behind it. Once this thread of liquid connects the electrodes, the melting of the remainder of the bath continues automatically, the whole being melted in some 15 to 20 minutes. The heating-up voltage is about 70; the furnace when working requires 5—30 volts, depending on its size and on the temperature desired. Naturally, as a rule, a transformer has to be used in connection with the furnace, to give the low voltage required, and a special type of furnace has been constructed with four electrodes to use in the case of a three-phase current supply, which has therefore to be transformed to two-phase.

The following table shows the power and current consumption for the four standard sizes at present made:—

Size	I.	II.	III.	IV.
Length of bath, inches ...	4¾	6	8	12
Breadth of bath, inches ...	4¾	6	8	12
Depth of bath, inches ...	4¾	6¾	10½	14½
KW. consumption at 750° C. ...	2·5	3·5	7·5	17 5
KW. consumption at 850° C. ...	3·0	4·5	8·5	20 0
KW. consumption at 1,150° C. ...	5·5	9·0	16 0	36·0
KW. consumption at 1,300° C. ...	7·5	12 0	22·0	48·0
Max. current at 1,300° C. in amps.	700	900	1,700	2,800

Dr. Harker, of the National Physical Laboratory, pointed out in the course of the discussion that remarkable efficiencies can be obtained with electric heating furnaces if only sufficient attention is paid to the lagging of the furnaces. There is, therefore, good reason to believe that with better lagging considerable economies could be effected in the above figures for kilowatt consumption for any particular temperature.

The body of the furnace is simply a fireclay crucible, surrounded by asbestos and a layer of lagging, and contained in a cast-iron case. It might be thought that the corrosive fused chlorides would destroy the fireclay crucible. As a matter of fact, cracks do develop, but these become filled with the molten salt, which then freezes therein, binding the parts of the crucible together in an ideal manner, so that their life is indefinitely prolonged. This has been the experience of all who have worked at the electrolysis of fused chlorides.

Perhaps the greatest advantage of an electrical heating furnace is the ease with which any desired temperature can be obtained and maintained; hence the pyrometer is an important feature of such an installation. The authors use a thermo-electric pyrometer, made of a platinum—platinum-rhodium couple, suitably contained in protecting sheaths of Marquardt composition and steel formed into an angle, so that the terminals are away from the destructive influences of the heat. This is connected to a dead-beat galvanometer calibrated in degrees Centigrade. Excepting for checking, however, the supply ammeter is found to give a sufficient indication of the temperature of the bath, and any required variations of temperature are easily obtained by simply varying the voltage, either on the primary or secondary side of the transformer. The uniformity of temperature obtained all over the bath is very striking, since the heat is produced *in situ* at every point in the furnace. Beneath an upper layer of fused salt the temperature is constant within 2 or 3° C., a constancy of temperature in marked contrast to what obtains in an ordinary gas-heated furnace, where, as a rule, even a pyrometer is not used, because its indications would be valueless, and where hardening temperatures have to be guessed by specially-skilled and experienced observers from the colour of the steel.

The hardening of a simple carbon steel involves two distinct thermal operations: (1) Heating it up to a temperature well above, but not too much above, the transition line at which martensite forms, that is to say, to a state where the carbon is finely and evenly distributed in the iron; (2) the fixation of the martensitic state by a rapid cooling down. If the steel cools slowly, the soft pearlite forms.

An electrical hardening furnace, leaving for the moment questions of cost aside, is almost an ideal apparatus for the first of these operations, for it enables any desired temperature (depending on the nature of the steel) to be attained easily, rapidly and exactly; it ensures the steel being heated uniformly (however varied its cross-section may be) to that temperature; and it prevents foreign matter, which might alter its carbon content or otherwise affect its composition, from coming into contact with the steel under treatment.

There remains to consider the question of costs. These are made up of cost of energy, maintenance, salt, labour, and preheating, where necessary. The largest item is the first; the crucibles have a life of 1,200-1,800 hours at 1,300° C., and up to 3,000 hours at lower temperatures; the cost of salt is trifling; while the ease with which the furnace is worked and regulated renders the labour costs small. The authors give the following comparative figures for operating an electric and a gas furnace—the results of actual practice—the costs being those for hardening 100 millers, each weighing about 12 lb.

Gas Furnace.				*Electric Furnace.*			
12,300 cb. ft. gas, at 3s. 6d.	£2	3	3	200 KW.-hrs., at 1·2d.	£1	0	0
Power for air blast ...	0	5	0	Coke for preheating...	0	1	0
Labour, 50 hours, at 8½d.	1	15	5	Salt	0	0	6
				Labour, 10 hours, at 8½d.	0	7	0
	£4	3	8		£1	8	6

The gas furnace operated on two millers at a time, and the electric only one, but the total time for hardening the 100 millers was 10 hours in the case of the latter, against 50 hours in the case of the former. Of course, gas at 3s. 6d. per 1,000 cb. ft. is exceptionally expensive, and the cost of producer gas in a works will be very greatly cheaper than this, but on the other hand, the electric furnace was only half the size of the gas furnace. By increasing the size and greatly improving the lagging, there is no reason why the power absorbed by the electric furnace should not be very greatly diminished.

Some 200 of these electric furnaces (which are being made by the A.E.G., Berlin) are at present installed, and they are used for such varied purposes as hardening tools, drills, cutters, millers, dies, printing rollers, &c.; in the manufacture of needles, pens, cutlery, chains, projectiles, &c.; and for scientific testing purposes. No doubt for certain purposes an electric hardening furnace cannot at present compete as far as costs are concerned with a large gas-fired furnace, but the introduction of electric heating means the introduction of the exact, controllable methods of the laboratory into the workshop, and as such has promise of a bright future.

The following nominations for the officers and council (1909-10) to be elected at the annual general meeting, were announced at the last meeting of the Faraday Society:—

President: J. Swinburne, F.R.S., M.Inst.C.E.

Vice-Presidents: Mr. G. T. Beilby, Sir R. A. Hadfield, Prof. A. K. Huntington, Dr. Ludwig Mond, Lord Rayleigh, Prof. A Schuster, and Mr. Ernest Solvay.

Treasurer: Dr. F. Mollwo Perkin.

Council: Messrs. E. J. Bevan, Bertram Blount, A. C. Claudet, W. R. Cooper, S. Z. de Ferranti, F. W. Harbord, W. Murray Morrison, H. F. K. Picard, J. L. F. Vogel, and N. T. M. Wilsmore.

A New Standard of Light.

By W. A. Harwood.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Manchester, on March 23rd*, 1909.)

The ideal qualities of a standard of light, viz., absolute constancy, exact reproducibility, simplicity, and utility under any ordinary conditions, are found to be in practice antagonistic. For instance, the Violle molten platinum standard is satisfactory so far as constancy and reproducibility are concerned, but is too expensive and complicated for every-day use; and, on the other hand, the simple, self-contained and portable flame standards are subject to considerable irregularities due to varying atmospheric conditions.

The difficulty has been in great part overcome by adopting three types of standards, viz., standards for ultimate reference, intermediate standards, and working standards, known respectively as "primary," "secondary," and "working" standards.

The Violle standard has been shown to fulfil satisfactorily the requirements of a primary standard, and the Fleming-Ediswan large-bulb glow lamps fulfil most of the conditions of a secondary standard.

Flame standards possess decided advantages in their simplicity and portability and in the fact that they are self-contained, for use as working standards outside the region of electric lighting,

The most serious objection to the Fleming-Ediswan glow lamp sets is the possible considerable cumulative error introduced by multiplying the number of photometer readings. The proposed new standard is intended as a secondary standard which may be stamped once for all with a given candle-power, and will retain its value exactly for an indefinite period, thus obviating the necessity of more than two sets of photometer readings.

The new standard consists of the light emitted by a fixed area of an incandescent metal strip heated electrically. Of various metals tried, pure platinum has proved most suitable for the purpose. The method of adjustment depends on the different absorbing qualities of black fluorspar and water for waves of heat and light. The percentage of total radiation emitted by a heated platinum strip, which is absorbed by black fluorspar, is found to increase as the temperature of the strip is raised; while the percentage absorbed by water diminishes. At one particular temperature of the strip these two percentages are equal, and their equality fixes the conditions of the strip uniquely. In the actual apparatus two parts of the radiation from the strip pass through a plate of black fluorspar and a layer of water respectively, and fall on two sensitive thermopiles which are connected in opposition through a galvanometer. The adjustment consists in regulating the current so that the galvanometer deflection is zero.

So far the strip has been photometered against an incandescent lamp run at constant voltage, with very satisfactory results.

The Combined Efficiency of Small Gas Engine and Producer Plant.

By A. H. Gibson, M.Sc.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Manchester, March 23rd*, 1909.)

A series of experiments has been recently carried out on a suction-gas producer coupled to a gas engine in the Engineering Laboratories of the Manchester University. The plant, which was supplied by the National Gas Engine Co., Ltd., is capable of developing approximately 24 B H P., and was run at approximately full power over the whole series of experiments. The object of the test was to determine the efficiency of producer and engine under different conditions of working. The fuel used throughout was gas-coke containing 81·75 per cent. of carbon and 1·19 per cent. of hydrogen, and had a net calorific value of 12,635 B.TH.U. per lb. dry. The general conclusions to which the experiments led are as follows:—

The composition and calorific value of the gas vary greatly with the quantity of water vapour supplied by the vaporiser, as does the thermal efficiency of the producer, the latter attaining its maximum value, viz., 78·6 per cent., when the gas produced has its highest calorific value, viz., 127·1 B.TH U. per cb. ft. at 32° F. under a pressure of 29·921 in. of mercury. The efficiency of the engine, however, falls off as the supply of gas becomes richer, the reduction of thermal efficiency being accompanied by a reduction in the percentage of heat rejected to the jackets, and an increase in the percentage rejected in the exhaust gases. The engine has a maximum thermal efficiency on the B.H.P. of 26·9 per cent. and a minimum efficiency of 22·8 per cent.

The overall thermal efficiency of the plant has a maximum value of 18·16 per cent. measured on the B.H.P., this occurring with a slightly greater vapour supply than that (·4 lb. per lb. of dry fuel) giving the maximum producer efficiency. This value coincides very fairly with that obtained by Drs. Bone and Wheeler in a series of trials on a large pressure producer developing approximately 3,000 H.P., and burning bituminous coal as fuel.

Under conditions of maximum efficiency in the small producer, the consumption of dry fuel amounted to 1·11 lb. per B.H.P. per hour.

Röntgen Society.

At the April meeting of the Röntgen Society Mr. J. H. Gardiner, F.C.S., read a paper on the development of the X-ray tube. In making his researches for this purpose, he had been impressed by the fact that in almost every instance in which an advance had been made, the seed from which the advance sprang was to be found in the work of Sir William Crookes. Indeed, so close had been the association of Crookes with the present X-ray tube and its forerunners, that it was one of the most extraordinary things in modern science that Crookes did not discover the rays in 1874, instead of leaving them to be discovered by Röntgen 21 years later. Speaking of the most recent developments in the manufacture, he said the introduction of the tantalum cathode was one of the greatest promise. He also pleaded with the manufacturers to make smaller and simpler tubes, instead of the present cumbersome devices, which often were good examples of glass-blowing rather than convenient instruments for the use of the medical man or the physicist. Finally, he suggested a simple means of prolonging the life of an X-ray tube by using a small magnet to deflect the focus of the cathode rays on to another part of the target when the first part had become worn. In the subsequent discussion Mr. W. Duddell thought that this magnetic deflection would be of no use save with tantalum anti-cathodes, and that it was only in connection with the more modern tubes that it could be properly applied. Mr. Campbell Swinton thought that such a procedure would make a difference to the radiographic results in point of sharpness. Owing to the fact that the cathode rays were not homogeneous but were of varying velocities, when the focus was deflected by means of a magnet on the end of the tube they would obtain not a proper focus but a series of spots, and the result would be a series of images, or at any rate a fuzzy image. Mr. Swinton thought that the introduction of tantalum cathodes might be of considerable value. In some experiments he had been carrying out using large powers—more than 50 milliamperes on occasion—one of his chief difficulties was due to the melting of the cathodes. Aluminium had a tendency to become red hot; magnesium had about the same melting point as aluminium, and when using platinum they got a deposit all over the glass. If the cathode could be made of tantalum, its higher melting point would be of great advantage. Mr. F. H. Glew thought that tantalum cathode would help to settle the point as to whether the cathode itself was a source of X-rays due to recoil. Such a theory appeared likely, and it was possible that rays of low penetrating power might be produced in this way, but that aluminium, being a poor target and therefore a poor source of X-rays, masked the effect.

AUTOMATIC STARTING GEAR FOR A.C. MOTORS.

The usefulness of hand-operated controllers is limited to those cases where motors can be started up and left running for considerable periods without attention. There are, however, a large number of cases where motors must be started up and stopped automatically without an attendant, at certain predetermined limits either of pressure or volume. In order to meet these requirements the Adams Manufacturing Co., Ltd., of Bedford and London, who have for a good many years specialised in the automatic control of D.C. and A.C. motors, have recently developed and put on the market a complete line of self-acting controllers for single-phase and polyphase motors, both of squirrel-cage and slip-ring types. We reproduce herewith some illustrations of actual apparatus which have been supplied by the above company of this type.

Fig. 1 illustrates a new type of D.P. solenoid-operated switch which has been designed for installations where the motor is comparatively small, and may be thrown directly across the lines to start, without starting resistances. In single-phase systems both lines to the motor are controlled; in two-phase systems the motor

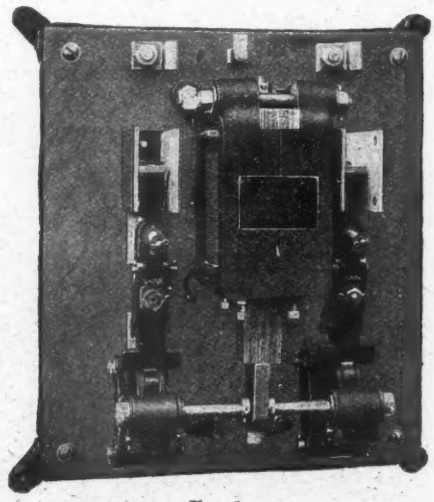


Fig. 1.

is controlled by a single-pole switch in each phase circuit, and in three-phase systems the circuits from two of the three-phase wires to the motor are controlled, the other wire being taken direct to the motor. When the self-starter has to be used on a single-phase circuit it is essential that the motor it controls shall be self-starting, and will develop the necessary starting torque. Standard two and three-phase squirrel-cage motors are in general suitable for operation under these conditions.

When the switch is used as a self-starter on compression tank systems, a relay is fitted (controlled by a pressure regulator) to make and break the solenoid circuit; but where it is used on open tank systems, the float switch makes and breaks the solenoid circuit directly.

The solenoid switch is a double-pole switch of open construction, controlled by a single-phase solenoid magnet. The main current-

carrying contacts are laminated brushes, pressed against stationary brass contacts by a toggle-joint mechanism ensuring perfect contact. Leading copper fingers are provided for making and breaking the circuit on substantial carbon blocks, which are readily renewable.

The pressure regulator used for operating this type of switch consists of a Bourdon pressure gauge movement, having an insulated finger. Mounted above the movement, in the same case, is an insulating base fitted with two brass rings, and mounted on these rings are adjustable pillars. These pillars are adjusted to the limits of pressure at which the motor is required to stop and start, and when the finger makes contact with the pillar at the lower limit, a very small current is passed through the energising coil of a relay; this relay being excited, closes the circuit through the solenoid winding of the main switch, which in turn closes, thus starting the motor. As the pressure rises, the insulated finger leaves the lower pillar, but the circuit through the relay is maintained by the contacts of the relay, and, therefore, no circuit is broken when the

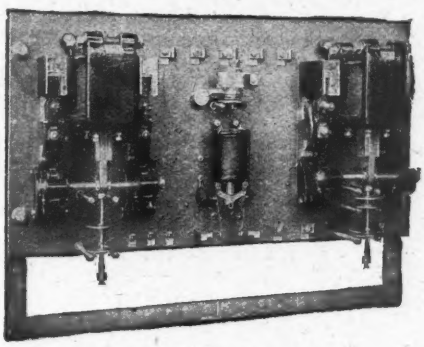


Fig. 2.

insulating finger leaves the pillar on the pressure regulator, and no sparking can take place at this point. As the pressure continues to rise, the needle travels round until it reaches the higher limit, at which point the needle makes contact with the top limit pillar, short-circuiting the coil of the relay. The contacts of the relay, therefore, open, breaking the circuit to the solenoid winding, which in turn opens the main switch, and the motor is thereby brought to rest.

The float switches used for open-tank systems have a quick make and break, independent of the rate at which the cord connected to the float is travelling; and as this switch is capable of carrying the current and making and breaking the circuit of the solenoid winding quite satisfactorily, there is no need for the introduction of a relay in this case.

For squirrel-cage induction-motors, which are used for driving centrifugal pumps or similar machinery where the starting torque necessary is materially less than the normal full-load torque, and where the motor will accelerate promptly with a voltage at the motor terminals not exceeding 60 per cent. of the line voltage, the type shown by fig. 2 is recommended. Resistance in the primary circuit of the motor is used in this case to reduce the voltage at the motor terminals for starting. One set of resistance is used in each of two phases, for either two-phase or three-phase motors, and these are cut out of circuit by a double-pole solenoid operating switch, after the motor has started and accelerated to the proper speed. The acceleration of the motor is controlled by "current relays" in the motor circuit. These relays are arranged to lift when the circuit is first closed, owing to the rush of current which takes place in the motor circuit; the current, however, falls as the motor accelerates, and when the current reaches a predetermined amount, the relay falls, making the circuit of the cutting-out solenoid, and thus permits the motor to be connected directly to the lines. The primary circuit to the motor for either two-phase or three-phase motors is controlled by a double-pole switch. As will be seen from the illustration, the self-starter is of the multiple solenoid type, and is entirely self-contained. It consists of a slate panel carrying the solenoid switches and relay, which is mounted on a supporting frame with the starting resistance behind.

An auto-transformer or potential type starter should be used with two or three-phase squirrel cage motors of 25 H.P. or more, driving centrifugal pumps, fans or similar machines. Two auto-transformers are used for either two-phase or three-phase motors, mounted in a common case and provided with suitable terminals. The transformers are oil-immersed, and have ample capacity for intermittent starting duty under light-load conditions. The self-starter is of the multiple-solenoid type, consisting of a slate switch-board carrying the solenoid switches and relays for the control of the motor and auto-transformer circuits. Small motors are controlled by a two-pole switch, but in the larger sizes, both two and three-phase, the motor is entirely disconnected from the lines in the off position of the starter.

The rate of acceleration is controlled by current relays in the stator circuit, which lift when the circuit is first closed, and keep the motor on the starting step until it has accelerated in proportion to the starting voltage; at the proper time the motor will be transferred to the next starting step. In the full-speed position the motor is connected directly across the lines, and the auto-transformers are cut out of circuit.

For slip-ring induction motors the self-starter shown by fig. 3 has been developed. These self-starters are designed for use with two-phase or three-phase slip-ring induction motors, and should be used for all cases where the motor must be started quickly and frequently, and especially where general conditions require that the starting current be kept as small as possible, and the line disturbance reduced to a minimum. The starters are rated on the basis that the motor is to be accelerated under load conditions, and that the starting current will not exceed 150 per cent. of the normal full-load current of the motor. In the running position of the starter, the switches have continuous capacity for the full-load current of the motor for both primary and secondary circuits. The self-starter is of the multiple solenoid type, mounted on a slate panel for carrying the solenoid operating switches and relays, the slate being mounted on an angle steel frame, with the resistance behind. In the case of large powers, however, the resistance would be separate from the panel, as it would render the apparatus too bulky if the two were combined.

The acceleration of the motor is controlled by resistance in each of the three phases of the rotor circuit, which is cut out of circuit step by step, by two-pole solenoid switches under the control of the secondary current relays. The secondary switches are interconnected with each other, and with the primary switch, so that they will close in succession to accelerate the motor after the primary circuit has been closed. The primary switch is also interconnected with the secondary switches, so that all resistance must be in the rotor circuit before the primary switch can close. The

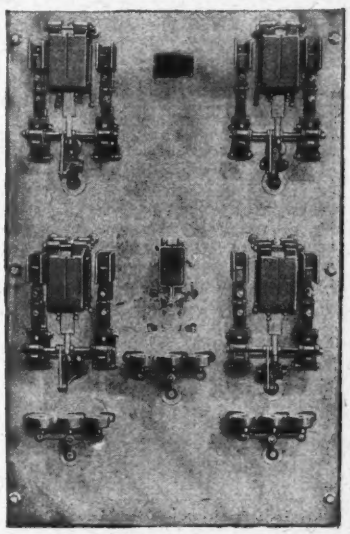


Fig. 3.

rate of acceleration is controlled by three-phase current relays in the rotor circuit, each arranged so as to prevent the following step of resistance from being cut out of circuit when it is lifted by the starting current, but which will drop again after the motor has accelerated properly. This will then permit the next step of resistance to be cut out. The starting current is limited to a predetermined and adjustable value by the current relays, and the rotor is accelerated in the shortest time consistent with this starting current. The current relays have three coils connected in the secondary circuit with the starting resistance, and carry the starting current: the relay plungers are thus controlled directly by the starting current, and the rate at which the motor is accelerated can be adjusted by varying the spring tension of the relay plungers.

Acton's Electricity Committee.—We have from time to time drawn attention to the peculiar methods of the Acton Electricity Committee; the following letter, appearing in the *Acton and Chiswick Express*, throws a sidelight on local affairs:—

"Sir,—An incident of an exceptional character took place at last night's meeting of the Electricity Committee. Councillor Page was in the chair, and the only other members present were myself and Mr. Schultess-Young. At the close of the proceedings Mr. Schultess-Young moved a vote of thanks to Mr. Page for the manner in which he had conducted the business of the Committee for the past year. This was opposed by myself on the ground that, since I had during the past year been opposed to the manner in which the affairs of the Committee had been conducted, I could not possibly thank Mr. Page for so conducting them. There being no one to second Mr. Young's motion, to the astonishment of those present, Mr. Page did it himself, and it was only carried by Mr. Page voting for it himself. I think this is the first time in the history of municipal affairs that a chairman has thanked himself for his conduct in the chair."

THE DESIGN OF SUCTION AND DELIVERY PIPES FOR CONDENSING PLANTS.

[CONTRIBUTED.]

In all modern power stations, especially those where steam turbines are installed as prime movers, the question of maintaining high vacua is of the utmost importance. The quantity of cooling water is generally very great, and the power required to deal with it is often so large, that it is essential a considerable amount of attention should be given to the design of the suction and discharge pipes. This is still more the case at stations where exhaust steam turbines are adopted, and where it is absolutely necessary that a high vacuum should be maintained.

In the consideration of condensing plant it is necessary, in the first instance, that the supply of water is sufficient for the purpose; further, that the water is free from chemicals, contamination or corrosive matter, which would have a detrimental effect on the pipes or apparatus through which it passed. Another important point is that the site chosen for the power station shall be as near as possible to a supply of water, otherwise the length of piping necessary to convey it to and from the power station will become costly and the extra power required to overcome pipe friction excessive. If the prevailing conditions are such that the condenser must be placed at a great height above the water, then the circulating pumps will have to be installed at a reasonable distance from the lowest level. This would probably involve the construction of a deep pit, jetty or some such expensive undertaking.

The site of the supply of water having been chosen, and consideration given to the lengths as well as the levels of the suction and discharge pipes, the next question to be decided is the size and dimensions of the various parts. The pipes and pumps, &c., must necessarily be of sufficient size not only to deliver the maximum amount of water required without excessive velocity and consequent fricitional loss, but also to provide pressure sufficient to overcome the condenser head.

The weight of water required for a high vacuum with a modern condenser is from 60 to 80 times the weight of the steam to be condensed, this figure depending on the type and make of the condenser.

The loss of pressure and volume, due to pipe friction, as previously intimated is a considerable factor in very long mains, and the friction is still further augmented by sharp bends and small branches which, wherever possible, should be avoided.

An ideal arrangement for the placing of pumps is at or near the lowest level of the supply of water so as to make the suction lift as small as possible. When the suction is taken from a tidal river the best position for the pumps is at about mean water level.

Should water be taken from artesian wells or bore-holes, which is not usually the case, the quantity of the yield ought to be carefully looked into, as the supply from these sources is very unreliable. Levels have often been known to alter, and the quantity of water obtainable may be considerably reduced after a time. It is also well to experiment with some temporary plant before the size and position of the permanent plant is finally settled. It should be proved whether a constant working level of water can be maintained in the hole when, say, 25 per cent. more water than is required is being taken away.

If the hole does not yield sufficient water, a good way to increase its capacity is to drill extra holes either parallel to the stratum or into a lower one. In the latter case it may be necessary to fit some auxiliary plant to lift the water to the main pumps.

Water is often raised from bore-holes by means of compressed air, though it is not intended to deal with the method here. The making and utilisation of bore-holes is very costly, but a supply of clean water can generally be relied upon, provided it is not drawn from a mineral stratum, in which case it is often corrosive, and as mentioned previously, might affect the pipes, pumps, or condenser tubes, and as a necessary consequence the results might be disastrous.

There are numerous ways by which circulating water can be dealt with. Pumps are generally adopted, and these may be divided into two classes—the reciprocating type, and the centrifugal or fan type. The latter is now almost exclusively used in modern stations. With either type of pump the height to which a column of water can be raised by "suction" is limited by atmospheric pressure. The word "suction" is really a misnomer, as a pump acts purely by displacement. With the reciprocating pump the piston first displaces the air in the suction limb, and the atmospheric pressure outside forces the water to rise in the suction pipe, though not to a greater height than that equivalent to the height of the barometer, or the pressure of the atmosphere, with certain deductions which will be explained hereafter. The average atmospheric pressure at the mean level of the sea is 14·7 lb. to the sq. in., and this pressure is capable of balancing a column of fresh water 33·9 ft. high, or, say, 34 ft. The height is usually taken at this latter figure.

Theoretically, a pump should be able to raise water by suction to the full height of 34 ft., but for many reasons this figure is never reached in practice, principally owing to the fact that water contains a certain proportion of air which is liberated when under a reduced pressure. Further, leaky glands, pipes, &c., are responsible for a certain diminution.

The usual maximum "calculated" height of suction lift for pumps of both types is never taken at more than 29 ft.; but this is an extreme calculation. At this figure all possible losses of head or pressure due to friction of the full amount of water passing along the pipe must be included; or, in other words, the vertical height of the pump above the water, plus the loss of head due to friction must not exceed 29 ft. This height is always taken to the highest point the water can rise in the cylinder in the case of a reciprocating pump, or the top of the pump case in that of a centrifugal pump. Small pumps must have a considerably lower suction lift, more especially if the strokes are short. Provided there is any chance of the circulating water rising to a high temperature owing to the discharge going back to the same source from whence the suction is taken, some allowance should be made for the "calculated" height at the increased temperature, as it will appreciably reduce the maximum suction lift permissible.

With all pumps, and those of the centrifugal type in particular, the best practice, as stated previously, is to place them as near low-water level as possible, in order to reduce the suction head to a minimum.

The water should have a free passage into the inlet pipe, which should be preferably bell-mouthed and of the "vena-contracta" shape. By this means the entry resistance is reduced to a minimum, and serious trouble due to cavitation of water in the impeller is thereby avoided.

If a reciprocating or piston pump is used where the pipes are long and of large diameter, it is advisable to place an air vessel or relief valve on the suction limb, for on the return stroke of the piston, the mass of moving water due to the atmospheric pressure, will meet the valves which are closing and create a hammering action. This sometimes causes a shock at the joints or weak parts of the system; it is also objectionable on account of the noise created. The air in the vessel forms a cushion against which the energy of the moving column of water may expend itself instead of against the pump valves. It is of great service to fit this air vessel with a gauge glass to show the quantity of air it contains; means should also be provided whereby the vessel can be replenished with air. The air vessel should be reduced in size as the number of water cylinders on the pump is increased.

If the pumps are placed at a considerable distance from the inlet, it is considered advisable to supply pipes of larger diameter than usual in order to reduce the head due to friction.

A very simple rule for loss of head, due to friction is:—Loss = 1 "head" for every 32 times the diameter of the pipe goes into the total length. The "head" referred to is that due to the velocity of the water in the pipes in feet per second. It is usual to add 1 head loss for sharp bends.

As an example of the application of this rule, assume that a pipe line is 200 ft. long, 10 in. diameter, and the velocity of water passing through it is 6 ft. per second. Then the head due to 6 ft. per second—

$$= \frac{v^2}{64} = \frac{36}{64} = \cdot 563 \text{ ft.}$$

The number of times the diameter goes into the length $= \frac{200}{10} \times 12 = 240$, and according to the rule 1 head has to be allowed for every 32 times the diameter goes into the length which, in this case, $= \frac{240}{32} = 7{\cdot}5$ heads lost; therefore the total loss due to friction $= \cdot 563 \times 7{\cdot}5 = 4{\cdot}22$ ft. head.

See now what the friction loss would be if the pipe was only 8 in. diameter instead of 10 in. The velocity would increase inversely as the square of the diameter of the pipe, thus 6 ft. per second would be—

$$6 \times \frac{10^2}{8^2} = 9{\cdot}4 \text{ ft. per second.}$$

The head due to this velocity $= \frac{9{\cdot}4^2}{64} = 1{\cdot}38$ ft., and the diameter goes into the length $\frac{200}{8} \times 12 = 300$ times. As above $\frac{300}{32} = 9{\cdot}4$ heads lost. Therefore the total loss due to friction $= 1{\cdot}38 \times 9{\cdot}4 = 13$ ft. head, as against 4·22 ft. in the first case.

The general velocity adopted for the travel of water in suction and delivery pipes is from 3 to 4 ft. per second, and this figure should not be exceeded. In the case of small pumps, the velocity should be even lower than this figure, for the loss of head due to friction increases rapidly in pipes of smaller diameter.

Strainers or strums fitted to suction pipes should have a good area through the holes of not less than twice that of the pipe which is to be supplied. There should never be less than two limbs to the suction pipe if there is a dirty suction, and in this case each limb should be of slightly larger cross sectional area than half that of the main pipe. The strums are connected to the ends of these limbs by means of swivel bends or rubber hose pipe; this latter material ranging in diameter up to 2 ft., and strengthened with a steel wire spiral, is easily obtainable. Each limb is controlled by a valve, and for the purpose of cleaning or repairs to one or other of the strums it is only necessary to shut the controlling valve and raise the strum to an accessible position, either below or just above water level; an operation which does not necessitate the stoppage of the condensing plant, another suction limb being always available.

The writer has had experience in the case of a large station where there are in use 12 rubber suction limbs, as described above, each 10 in. in diameter and 20 ft. long. These limbs are arranged in four groups, each feeding into an 18-in. pipe fitted with a retaining valve, a dirt box, and also a sluice valve. The 18-in. pipes in turn feed into a 36-in. main. The strums are cleaned every day at low tide, three being shut off at a time by means of the sluice valve on the larger pipe. The strums are hauled up separately at the end of a rope by special tackle fixed in a boat and passing over the stern. The position of each of the strums is indicated by a float, the rope of which is used for the purpose of lifting the strum, the tackle having been made fast previously.

The strums can be suspended from a framework, if convenient, with balance weights on each to facilitate their being raised. The holes in the strums should be as large as possible, yet of a size small enough to prevent the passage of the particular foreign matter usually met with in the case under consideration. Where there is an unusually large quantity of foreign matter likely to be drawn into the pipes, it is a good practice to fix a dirt box, preferably one on each limb, or one on the main suction pipe. This dirt box should have a strainer plate with a large area of small holes, not larger than those of the condenser tubes, and also a deep cavity into which dirt can drop and afterwards be collected. The strainer plate should be of a removable type for cleaning purposes, and the door which is necessary for cleaning, is an excellent means of access to the box. Care should be taken to place the dirt box in an accessible position on the suction pipe, so as to obviate any difficulties in the cleaning.

When the pumps are placed at a great height or distance from the source of supply, a retaining valve should be fitted at the lower extremity of the pipe, or as near to it as possible, preferably one for each limb or set of limbs.

The retaining valves should be of the single-flap type for a horizontal pipe, or the double-flap type if they are adopted as foot valves on a vertical pipe.

In all cases these valves should have a sectional area, when full open, slightly in excess of that of the pipe on which they are placed. In certain cases where large pumps are employed, it is advisable to dispense with retaining valves altogther, for accidents through concussion are liable to occur at any time. These concussions may be caused by a sudden stoppage of the column of water travelling through the pipes, possibly brought about by an impeller ceasing to rotate. The pump when working is not only supporting the column of water, but is sending it forward, and the reaction when the pump stops will be dependent on the weight of the water and the velocity it attains in falling before the valve can close. This reaction has often been known to split both the pump casing and pipes.

No centrifugal pump is capable of expelling the air from the suction pipe, which is present at starting, if the pump is not drowned, and various methods have been adopted to overcome this difficulty. Before the pump can commence operation, it is absolutely necessary that there should be an unbroken column of water extending as far as the top of the impeller blades, and in order to ensure this, it is usual to fit a steam ejector at the highest point of the pump case, or if the discharge is drowned and a siphon action is depended on, the ejector should be fitted at the highest point of the pipe system. This ejector exhausts the air from the pipe and permits the water to flow in by atmospheric pressure.

When it is necessary to charge the whole of the pipes, the most satisfactory method of making sure that there are no air locks is to connect the suction to the discharge pipe by means of a by-pass situated at a low level and controlled by a valve. By this method the two limbs can be filled from the lower ends, but it is also necessary to fit a sluice valve at the lower end of the discharge limb, should it not be drowned, and this valve should be closed for the above procedure. In any case, it is advisable to have a sluice valve on the discharge limb, even if the discharge be drowned, as it is useful for more reasons than one. It is also necessary to have a cock on the highest part of the pipe system, to allow the air to escape when charging by means of the above method. Care should be taken, if the above arrangement is adopted, that the by-pass valve and condenser cock are closed and the discharge valve opened before the condenser is finally connected to the machine. It might also be advisable in the above case to have a relief valve fitted on the highest part of the system to make sure that the pipes are charged, as well as to prevent undue pressure on them.

Messrs. Gwynne are the manufacturers of a patent charging apparatus, which has been described in these columns, consisting of a small tank which it is only necessary to fill with water once. This apparatus is bolted on to the suction branch of the centrifugal pump, and when started up will exhaust all air from the main pump and pipes.

The frictional resistance of water in pipes increases directly with their length and almost as the square of the water velocity, so that it will easily be realised that if the velocity is high, the resistance in small pipes and bends becomes of considerable magnitude.

Suction pipes of unusual length should, wherever possible, have a slight rise towards the pump so as to prevent air locks caused by imprisoned air at any point. If the pipes are not thoroughly charged with water, trouble must necessarily follow.

If through peculiarities of design it is impossible to adopt the above recommendation, a cock or relief valve should be placed at the highest point at which air is likely to accumulate, or other suitable means adopted, in order to get rid of the air. Of course this method is only possible with delivery pipes leading up to the condenser. As briefly stated above, it is usual to water-seal the discharge end of the delivery pipes in order that a siphon action may be set up when the pump is in operation. Thus, some of the power necessary to drive the pump, by reason of the equalisation of the head due to the difference in level between the suction and discharge will be saved, leaving only the head due

to friction of the water in the pipes and condenser to be overcome.

Sometimes a small motor-driven pump is fitted on large mains to extract the air from the pipes.

It is well to place the mouth of the outlet pipe at some distance from the inlet, preferably in the same line of direction as the current, in order to prevent the discharge water being drawn back to the inlet. The further these pipes are apart the better, for when a great quantity of water is required and the amount of water at hand is small, or the stream slow, there is a chance of the suction water rising in temperature due to the discharge, and thus affecting the efficiency of the condenser.

The design and material for pipes, and the method of laying and jointing them, are all factors of considerable importance. A leakage of air in a suction pipe or a siphon delivery pipe causes considerable loss in the pumps, which is often a source of much annoyance to locate, more especially if the pipes are placed underground.

Cast-iron pipes with flanges are most generally adopted in the case of circulating water pipes. It is usual to drill and bolt the flanges in accordance with the British Standard Table No. 1. Lap-welded steel pipes are sometimes used for the sake of cheapness; also, because they are more easily handled, but on account of their very short life, especially if buried underground, they are not to be recommended. Spigot and socket pipes are very often used for long pipe lines, for the simple reason that they are cheaper than flanged pipes as well as being a standard commodity. They are also much more flexible than flanged pipes; at the same time they are likely to give trouble at the joints when laid in bad ground.

The joints in the case of spigot and socket pipes are made with yarn and lead in the manner usual in the case of water mains.

All cast-iron pipes should be free from blow-holes, have their flanges faced in a lathe, and be tested by the makers under hydraulic pressure before delivery. They should also be tested if possible after laying and jointing.

If the pipes are to be laid underground, care should be taken that they are laid on a firm bed, and also that they are placed at a sufficient depth to protect them from external mechanical injury as well as frost.

When there is any possibility of a subsidence, as is sometimes the case where a river is contiguous, or from any other cause, it is necessary with a flanged pipe main to put short lengths of copper pipe here and there as the circumstances warrant to guard against the pipes cracking, a circumstance which might easily be brought about by undue strains.

Where pipes are to be laid on a soft foreshore, another precaution is to place ordinary railway sleepers under them at right angles, thus giving them a greater bearing surface.

Suction or discharge pipes should never have square cornered tee or elbow connections. In all cases bends should be made with the largest sweep or radius possible and arranged in agreement with the direction of the flow of water.

Pipes should invariably be coated both inside and outside with Dr. Angus Smith's composition, which is a great factor in arresting corrosion or the adhesion of deposit. It is also well in cases where, in space of time, there is likely to be a deposit, to make the pipes of larger diameter than would otherwise be necessary.

In America and on the Continent the suction and discharge pipes are often constructed of ordinary or reinforced concrete, but in most cases the use of cast-iron is preferred.

In the above article the endeavour has been to deal with the most important points in the design of suction and delivery pipes; at the same time, it should be borne in mind that individual requirements differ, and each case presents difficulties and peculiarities of its own, which makes it almost impossible to lay down any hard and fast rules.

Whitehaven Electric Lighting.—The T.C. has decided to supply energy to electrical contractors for displaying electrical appliances in their shop windows, at 1½d. per unit.

EQUITY v. EXPEDIENCY—A TARIFF QUESTION.

By ERNEST E. SHARP, A.M.I.E.E.

The question of tariffs has been very well "done" during the last 15 years, but the passing of the Demand Indicator, and the rush of all sorts of new tariffs to take its place, are worth noting. This being a controversial subject, let me forestall at least one criticism:—I *know* that power companies and Acts of Parliament still make a point of the maximum-demand principle, but the former have a very good reason for maintaining it; it is a convenient arrangement for making the best terms possible with each individual consumer without making comparisons easy. If some of the power companies would only publish a few of their fancy quotations (which, of course, they will not) it would be found that even a M.D. enthusiast would have to sit tight and think hard in order to see through their intricacies. They are equalled only by some of the suggested "simplifications" in charging! Take, for instance, the suggestion of one of the Colonial engineers some time back. He led off with a complaint of the cost and complication of meters (a small fire that causes quite a lot of smoke), and then proceeded to describe a combination maximum-demand-indicator-maximum-current-circuit-breaker-time-switch that must have been much dearer than a meter, and simply appalling in its complexity. It was evidently a growth that would not stand transplanting; in fact, I believe it proved a weakling in the country of its origin. Then, at irregular intervals, someone suggests going back to the contract system, as though that had not proved a failure over and over again. Those who would modify this by putting in a "blinker" have already discovered that a meter is less trouble—and not much more expensive in the long run. It will be noted that all these ideas are quite forgetful of the equity so beloved of the maximum-demand people: expediency is being considered.

While all this talk has been going on, there has been gradually growing in favour a system which was tried years ago, and had to be abandoned through want of suitable apparatus—viz., the two-rate system. Judging by the number of stations that are taking this system up, it seems like becoming the chief system of charging for consumers having electric heating or power as well as lighting. It contains both equity and expediency, and either can be made to preponderate according to circumstances, so it ought to suit engineers of both shades of opinion. It will be interesting to trace the origin and growth of this system, its advantages and its limitations.

Dr. Gisbert Kapp was the first to suggest this method of charging, and he took out a patent for it about 16 years ago. It will be readily understood that the electrical world was hardly ready for such a system at that time, and so the idea languished. Some years later Mr. R. P. Wilson adopted the system at Dudley, Aston, Pontypridd and other stations for which he was consultant, but it never flourished except at the former. The reasons for the failure were various. At Aston, for example, it was found that consumers kept their gas fittings installed and reverted to gas lighting during the high-rate period. The result was a false peak in the demand—a peak coming at the wrong time of day, and being far below what the real peak should have been. Of course, there is no great difficulty in overcoming this, now that we have the experience to guide us. The main difficulty, however—and it is not unfair to anyone at the present day to say so—was in the instruments, and more especially in the time switch. So once more the system languished, but not for long this time. As soon as a suitable time switch was available, this method began to gain the appreciation due to it, and it is now being used in 70 or 80 towns in this country—towns of every variety, industrial, residential, and holiday. Of course, it is not used for every consumer in these towns, but its possibilities are very wide. For works having electric driving and lighting, its advantage is obvious. In barbers' and scores of other shops, it enables small motors to be got in, because

it does not necessitate the wiring of a separate circuit in order to get the advantage of power rates. The same remark applies to heating and cooking appliances in the home; radiators in winter, fans in summer, kettles, shaving pots, grills, and flat irons all the year round. Very few people will pay for these at ordinary lighting rates, and, rather than have the bother and expense of wiring a separate circuit, they would go without these (electrical) appliances. A low rate for the lighting of shop windows after closing time (a much neglected source of revenue) is also made possible by this system. Its simplicity, too, has much to recommend it, and the canvasser does not have to spend a lot of his time in a vain endeavour to explain to, say, a barber, why his intermittent motor is charged at 1d. per unit, while the lamp alongside, which is burning all day, costs 4d. a unit. It is simple, too, in the accountant's department. Another, and a very important advantage, is that the high rate can be varied as the seasons rotate.

The one disadvantage that is sometimes urged against it, viz., cost, is easily disposed of. The only simple and sound alternative is the use of two meters, which means almost the same cost to the station, and, to the consumer, means extra wiring. Most consumers willingly pay a rental for the two-rate meter and switch in preference to this—even in districts where meter rents are not the rule.

In the old days of the two-rate system, the meters employed were either of the watt-hour or the *shunted* ampere-hour type. In the former case, a resistance was switched into the pressure circuit during the daytime to cause the registration to be at one-quarter the proper rate, which was, of course, equal to reducing the price from, say, 4d. to 1d. With the shunted ampere-hour meter the same result was obtained by switching in an extra shunt during the daytime. In both cases the high and low-rate units were all measured on the one dial, and this deliberate falsification of the meter readings during the day led to many disputes. The present method is to use an ampere-hour meter having two dials and fitted with a throw-over gear, operated by a solenoid connected across the mains and switched in and out by a time switch. This refers to D.C. working. For A.C. working, it is usual to employ two meters in series, the shunts of which are connected to a change-over time switch, so that only one shunt is alive at a time.

The writer would have liked to give some particulars as to the usual ratio of high to low rate, high-rate hours and other information of a like nature, but the system is such an elastic one that engineers who have adopted it have suited the system to the district. At Croydon, for instance, the high rate (*higher* rate would be more correct here) is 3d., and the low rate 1d. At Mansfield the figures are 7d. and 1d. At Dundee they are 6d. and ½d. Probably Barrow, with its 6d. and 1d., is nearer the average. Then, as to hours, in most cases these follow the seasons for starting the high rate, and a fixed hour, usually 10 or 11, terminates it; but where late shop-window lighting is encouraged, as at Newcastle, the latter hour is obviously too late. In some cases, as at Oldham, a fixed starting time is found better suited to the needs of the district. A refinement of the system that suits some localities is to have no high rate on early-closing days and Sundays. A very simple addition to the time switch makes this possible. A somewhat similar idea is carried out by some users of demand indicators, who cut out the D.I. during certain hours, and all day long on certain days. Stepney is an instance of this.

In conclusion, it may be pointed out that the Board of Trade have indirectly approved of the system in having granted their approval last year to a time switch for use with two-rate meters. While we are all looking forward to the day of the one flat rate for all purposes and times, it is as well in the probably long interim to make use of the next simplest thing, viz., two flat rates.

Worcester Electric Lighting.—On March 16th a Local Government Board inquiry was held respecting the application of the T.C. for a loan of £5,752 for electricity purposes, including £852 excess expenditure. The balance is for mains. There was no opposition.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

CHILE.—Duties are payable in a certain percentage of values fixed by the Customs authorities, consequently the information given below is divided into two sections: the *ad valorem* rates of duty, and the values on which such *ad valorem* rates are calculated, and to ascertain the exact amount of duty to be paid reference must be made to both these statements.

Marks of all cases for Chilian ports must be stencilled or branded, and not made by hand; the gross weight in kilogrammes must be stated on all packages on the same side as the mark, and this weight must also be stated on documents and bills of lading. Consular invoices in quadruplicate must be made out for each consignment, on special forms to be obtained from the Consulate. Invoices must be examined and signed by the Consul, fees being levied at the rate of 1 per thousand *ad valorem*, with a minimum of 4s. for invoices not exceeding £40. The origin of the goods must be declared on all documents.

Ad valorem rates of duty.

	Ad valorem.
Articles of tinplates other than tools	60 %
Houses of iron, steel or wood; sheet iron, galvanised or corrugated; porcelain; manufactures of zinc	35 %
Axle-boxes, axles; steam boilers imported separately from the machines; cement; springs of iron or steel; bridges of iron or steel; sleepers of iron or steel; steelwork for building purposes wrought in any manner	15 %
Asbestos in lumps or powder; railway switches complete, of iron or steel, or detached parts thereof; conduits or tubes of composition metal, lead, copper, bronze, iron or steel, galvanised or not, including elbows, joints, or other accessories; railway passenger carriages; machine belting of all kinds; sheet iron or steel, corrugated, neither painted nor galvanised	5 %

The following goods are admitted free of duty:—Wire of any metal, covered or not with other materials; cables of wire; copper and bronze in sheets; axles, tires and wheels of iron or steel, other than carriage axles; pulleys of any material; implements and their extra parts for use in mining, and industry not separately mentioned; iron and steel in plain sheets neither painted nor galvanised; ordinary tin plate; scientific instruments; telephonic and telegraphic apparatus, insulators, iron or steel posts and other appliances for telegraphs and telephones, except wooden brackets for posts; machines, apparatus and special accessories for illuminating by electricity, except lamps of all kinds, but including bulbs and candles; machines and apparatus for use in trades and industry; iron or steel plant for railroads, whether steam, animal or electric traction, and likewise portable or elevated railway plant, with the exception of materials dutiable at the rate of 15 %; tape paper for telegraphs; lead in sheets, bars or plates.

Goods not specially mentioned in any of the above classes are liable to a duty of 25 % *ad valorem*.

Valuations fixed for Electrical and similar Materials.

	Pesos per kg.
Machine belting of rubber, &c., with or without tissue or parts of metal (5 %)	3
Tubes or tubing of rubber, combined or not with tissue or parts of common metal (25 %) ...	2
Pushes for electric bells, of wood (25 %)	6·50
Steel or iron unwrought, in bars or plates; switches, points, sleepers, fishplates or frogs for railways, unwrought iron in any form; sheet iron, plain, neither painted, tinned nor galvanised; corrugated sheet iron, neither painted, tinned nor galvanised; railway ties	·12
Unwrought steel or iron in perforated plates for machines, lamps and hanging lanterns of iron, springs for locomotives, &c.	4
Iron wire, round, square or of other form, with or without barbs, whether galvanised, coppered, tinned, painted, burnished or not; corrugated sheet iron, painted, tinned or galvanised ...	·20
Covered iron wire for electric current transmission	3
Boiler bottoms and boilers	·30
Supports for telegraph or telephone poles of iron ...	·55
Conduits and pipes, including elbows, bends and joints	·25
Chairs for railways	·30
Beams, columns, &c., whether painted or not, for building purposes	·30
Electric meters	·80
Pipes, conduits and accessories, of cast-iron ...	·15
Ditto, of copper	1
Ditto, of lead	·25
Asbestos: in lumps, powder or fibres	·14
Cardboard or slabs	·50
Cables, ropes or yarn, whether combined with other materials or not for machine packing ...	1·25

	Pesos per kg.
Asbestos or composition of asbestos and cement for stopping up boilers	·20
Pipes of stoneware, whether glazed or not	·08
Cement	·04
Glass or earthenware jars, with or without preparation for electric batteries...	·50

The value of the peso for calculation of duties payable is 1s. 6d.

DUTCH TARIFF ALTERATIONS.—The Dutch Minister of Finance has issued a decision to the effect that locomotives propelled by benzine, benzol or petroleum motors and electric accumulator locomotives, if they cannot be used for carrying passengers or goods, shall be exempt from duty on importation into Holland.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

8,077. "Improvements in electric lamp holders." J. Sedgwick. April 5th.

8,105. "Automatic circuit breaker." G. Hansen. April 5th.

8,108. "Improvements in heating coil protecting devices for weak current electrical circuits." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) April 5th. (Complete.)

8,111. "Improvements in and relating to discharge gaps for the production of electric oscillations." A. W. Sharman. April 5th.

8,112. "Improvements in or connected with apparatus for electrically igniting miners' safety lamps in mines." P. Buckley. April 5th.

8,123. "Improved electric clock and movement." F. Schneider. April 5th.

8,146. "Improved process for manufacturing electric incandescent lamps." R. Hoffelt. April 5th. (Complete.)

8,150. "Improvements in and relating to electrodes for arc lamps." G. Senftner. (Date applied for under Sec. 91 of the Act, April 14th, 1908, being date of application in Germany.) April 5th (Complete.)

8,151. "Improved method of producing the electrodes of arc lamps." G. Senftner. (Date applied for under Sec. 91 of the Act, December 17th, 1908, being date of application in Germany.) April 5th. (Complete.)

8,168. "Improvements in electrical apparatus for locking levers operating railway and other switches, signals, and the like from a distance." Societe Ch. Legrand et Cie. (Date applied for under Sec. 91 of the Act, April 9th, 1908, being date of application in France.) April 5th. (Complete.)

8,191. "Improvements in or relating to indicators operated by alternating current." Felten & Guilleaume Lahmeyer-Werke Act. Ges. (Date applied for under Sec. 91 of the Act, July 11th, 1908, being date of application in Germany.) April 5th. (Complete.)

8,194. "Improvements relating to electric induction furnaces." The Grondal Kjellin Co., Ltd., and J. Harden. April 5th. (Complete.)

8,195. "Improvements in positive electrodes for primary or secondary electrical elements with alkaline electrolyte." Nya Ackumulator-Aktiebolaget Jungner and A. T. K. Estelle. April 5th. (Complete.)

8,202. "Improvements in electrical signals." A. C. Brown. April 6th.

8,205. "Improvements in electric accumulator sub-stations." A. M. Taylor. April 6th.

8,212. "Improvements in electrical cartridge fuse holders." J. Ford and E. E. Bonshor. April 6th.

8,231. "Improvements in electrical switches and cut-outs." C. M. Dorman, R. A. Smith and H. G. Baggs. April 6th.

8,261. "Improved process for the electro-deposition of metals or alloys, on other metals or alloys, fabrics or substances such as cottons, silks, woollens, stone, plaster or wood." J. H. S. Bradley and W. H. Thew. April 6th.

8,263. "Improvements in and relating to electric fuse fittings." Siemens Bros. Dynamo Works, Ltd. (Siemens & Halske Akt.-Ges., Germany.) April 6th. (Complete.)

8,264. "Improved electric bell-press." E. C. Rayment and S. G. Rayment. April 6th.

8,266. "Improvements in electrical apparatus for igniting miners' safety lamps." A. E. Best. April 6th.

8,281. "Improvements in automatic electric cut-outs." E. Freeman. April 6th.

8,283. "Improved method of regenerating blackened carbon-filament lamps." E. A. Kruger. (Date applied for under Sec. 91 of the Act, April 6th, 1908, being date of application in Germany.) April 6th. (Complete.)

8,293. "Improvements in or relating to electrically-wound clocks." A. Lokel. April 6th.

8,303. "Improvements in and connected with electric indicators." W. B. Holmes and R. McPherson. April 6th.

8,315. "Improvements in and relating to electrically-operated valves." I. G. Waterman. April 6th. (Complete.)

8,345. "Improvements in self-regulating alternating-current additional machine or booster." R. Moser. (Date applied for under Sec. 91 of the Act, July 11th, 1908, being date of application in Austria.) April 6th. (Complete.)

8,351. "Improvements in and relating to electric lamp-making machines." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) April 6th.

8,356. "Safety device for electrical apparatus." G. W. O. Howe and J. T. Irwin. April 7th.

8,382. "Improvements in or connected with means for the manufacture of bushes or bearings for shafts, axles, electro-motors, dynamos, self-propelled vehicles and the like." W. G. Hanna and R. W. Hanna. April 7th.

8,383. "Improvements in electric arc lamps." A. Jopling. April 7th.

8,405. "Anti-vibrator for electric incandescent lamps." J. Poleschowsky. April 7th.

8,419. "Improvements in or relating to electric conductors." R. K. Gray. April 7th.

8,422. "Improvements in or relating to electric ignition devices." W. A. Trier. April 7th.

9,429. "Improvements in or in connection with electrical switches." A. P. Lundberg, G. C. Lundberg and P. A. Lundberg. April 7th. (Complete.)

8,443. "Improvements in electric furnaces for the treatment of gases or gas mixtures." Saltpeter Saure Industrie Gesellschaft G.m.b.H. (Date applied for under Sec. 91 of the Act, May 22nd, 1908, being date of application in Germany.) April 7th. (Complete.)

8,456. "Improvements in and relating to electrically operated cranes, lifts and the like." Allgemeine Elektricitats Ges. (Date applied for under Sec. 91 of the Act, April 8th, 1908, being date of application in Germany. (Application for Patent of Addition to No. 17,622, of 1908.) April 7th. (Complete.)

8,489. "Improvements in magneto-electric machines." F. Burke. (Date applied for under Rule 13, March 5th, 1909; an invention comprised in Application No. 5,320, dated March 5th, 1909.) April 8th. (Complete.)

8,513. "Improved jar for electrical storage batteries and wet cells." R. Thornbery. April 8th.

8,521. "Improvements relating to magnetic brakes." J. N. Mahoney and O. S. McCurdy. (Date applied for under Sec. 91 of the Act, April 20th, 1908, being date of application in United States.) April 8th. (Complete.)

8,535. "Improvements in fuse and switchboards." W. Schmahl and A. R. Henderson. April 8th. (Complete.)

8,570. "New or improved time relay for electric currents." D. Timar and R. Ziegler. (Date applied for under Rule 13, December 12th, 1908. An invention comprised in Application No. 26,967, dated December 12th, 1908.) April 8th. (Complete.)

8,581. "Improvements in apparatus for wireless telegraphy." G. Marconi and Marconi's Wireless Telegraph Co., Ltd. (Application for Patent of Addition to No. 17,505, 1908.) April 8th.

8,582. "Improvements in transmitters for wireless telegraphy." G. Marconi and Marconi's Wireless Telegraph Co., Ltd. (Application for Patent of Addition to No. 20,119, 1907.) April 8th.

8,601. "Improvements in conduit fittings for electrical and other purposes and in the manufacture of same." A. Brampton and F. Osborn. April 10th. (Complete.)

8,619. "Improvements in or relating to enclosed electrical switches." H. W. Cox. April 10th.

8,620. "Rapid 'make' and 'break' electrical switch movement with interlocking full-off and full-on device." J. Stevenson and O. R. Williams. April 10th.

8,649. "Improvements in or relating to the trolley heads of electric tramcars and the like." S. R. Thompson. April 10th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

Electric Bells. C. Herrde. 27,457. December 12th. (Cognate Application No. 12,567 of 1908.)

1908.

Electric Auto-Musical Instruments. T. E. Phillips. 5,170. March 5th.

Switch for the Control and Transmission of Electric Energy. R. P. Myers and E. A. Gedge. 5,628. March 13th.

Process for the Electrolytic Production of Aluminium Oxide. F. W. Morris. 6,449. March 23rd.

Dynamo-Electric Machines. British Thomson-Houston Co. and F. H. Clough. 7,327. April 2nd.

Electric Device for Preventing Collisions of Railway Trains. C. Lagden and A. Catchpole. 8,357. April 15th.

System of Electromagnetic Control of Distant Mechanisms. P. Fromaget. 9,676. May 4th. (Date applied for under International Convention, May 4th, 1907.)

Electrical Timed Contact Making and Breaking Devices. I. H. Parsons and A. E. J. Ball. 9,917. May 7th.

Thermo-Electric Batteries. J. Marschall. 12,841. June 16th.

Electric Arc Lamps. Siemens Bros. Dynamo Works and C. R. Riber. 13,580. June 27th.

Electrical Vulcanising Apparatus. J. Hay, H. R. Couper and E. H. Lindsay. 14,121. July 3rd.

Manufacture of Refractory Electric Conductors Suitable as Filaments for Lamps. W. D. Coolidge. 17,620. August 21st. (Date applied for under International Convention, August 24th, 1907.)

Magneto-Electric Machines Particularly for Ignition in Explosion Engines. J. Guernet. 18,106. August 28th.

Electro-Plating Apparatus. G. A. Lutz. 18,220. August 31st.

Dry Battery Cells. W. S. Doe. 18,721. September 7th.

Magnetic Separators. H. Alcock and H. C. Simpson. 18,855. September 8th.

Therapeutic Apparatus for Treatment with Magnetic Radiations, Electric Light Rays and other Agents. J. Willig. 20,505. September 30th.

Device for Driving Electric Clocks and Similar Apparatus. W. Fairweather. (Aktiebolaget L. M. Ericsson & Co.) 20,976. October 5th.

Production of High-Frequency Electric Oscillations. R. A. Fessenden. 21,263. October 8th. (Date applied for under International Convention, October 31st, 1907.)

Method of and Apparatus for Signalling by Electricity. W. Popow. 23,426. November 3rd.

Telephonic Installations. M. Baumer. 23,690. November 4th.

Electric Switches. A. P. Lundberg, G. C. Lundberg and P. A. Lundberg. 24,058. November 10th.

Devices for Suspending Pipes, Electric Cables and the like. R. Höing. 27,043. December 12th.

Application of Portable Motor-Generators for Charging Cells and other Purposes. J. R. Craig. 5,440. March 11th.

Electric Light Fittings. F. M. Long. 5,681. March 13th.

Current Collecting Devices for Electrical Railway Vehicles. R. Christian. 5,686. March 18th.

Singeing Textile Fabrics by Means of an Electric Current. G. Gin. 5,856. March 16th. (Rights under Sec. 91 of the Patents, &c., Act, 1907, not granted.)

Automatic Electrical Switch. O. Gerhardt. 5,879. March 16th.

Suspension Devices for Electric Lamps. R. Baron. 6,069. March 18th.

Electric Switches for Charging and Discharging Electric Accumulators. F. Hodgson. 6,187. March 20th.

Electric Lighting and Heating of Vehicles. H. Grob. 6,228. March 20th. (Date applied for under International Convention, March 20th, 1907.)

Electrical Alarms for Tramcars and the like. T. R. Kinsella and C. W. Hodgetts. 6,482. March 23rd. (Date applied for under International Convention, March 21st, 1907.)

Controlling of Electric Motors. Sir W. G. Armstrong, Whitworth & Co. and F. Harlow. 7,811. April 8th.

1909.

Electric Motor Meters. A. Zipplies. 686. January 11th. (Date applied for under International Convention, January 18th, 1908.)